VOL. XXII. No3 MARCH 1937

MECCANO MAGAZINE

MODERN BLAST FURNACE PLANT (see page 130)

HORNBY ELECTRIC & CLOCKWORK TRAINS

The Most Fascinating Pastime in the World!

RUN YOUR OWN MODEL RAILWAY!

You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

The performance and durability of the Hornby Electric Trains place them in a class entirely their own. Each locomotive is fitted with a powerful motor that will pull heavy loads at high speeds, always under perfect control.

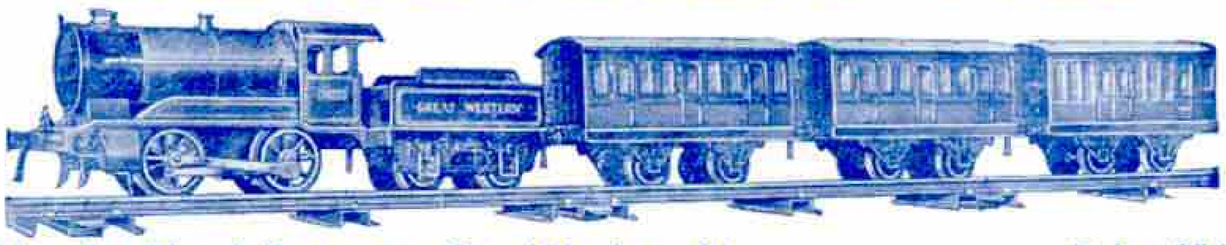
Hornby Clockwork Trains are hauled by the longest-running spring-driven locomotives in existence. The motors fitted are of the highest quality, being perfect mechanisms with accurately-cut gears that ensure smooth running.

Hornby Train Sets are available at prices ranging from **15**/– to **75**/– for Electric models and **4**/**11** to **65**/– for Clockwork models.

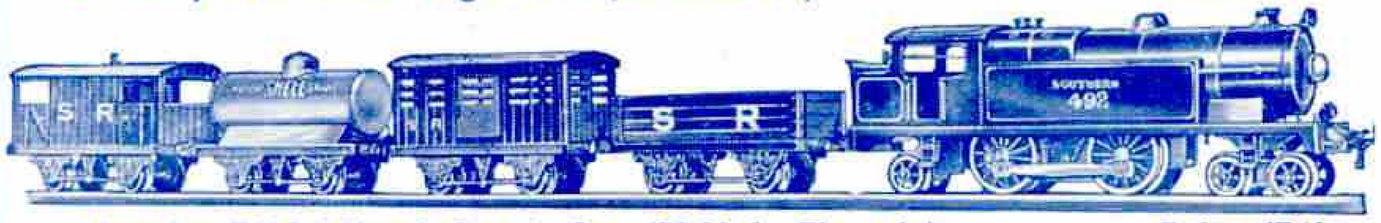
ASK YOUR DEALER FOR A COPY OF THE LATEST CATALOGUE.

A SELECTION FROM THE RANGE OF HORNBY TRAINS

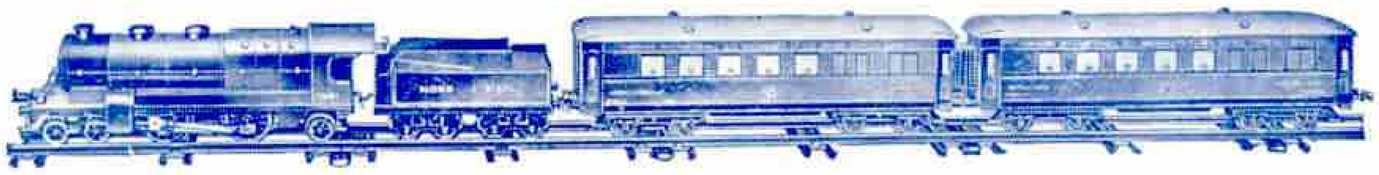
EM320 Tank Goods Set (20-Volt Electric) ... ... Price 24/–



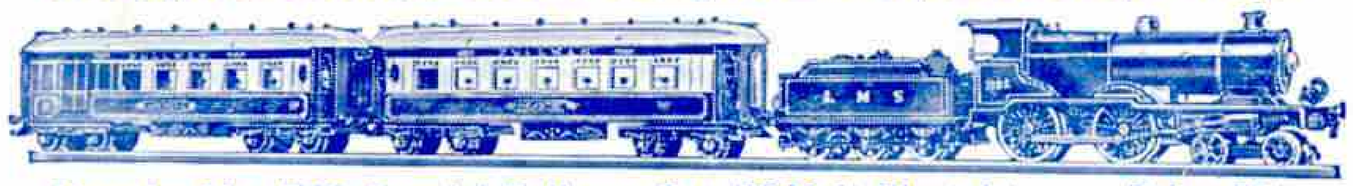
Hornby No. 1 Passenger Set (Clockwork) ... ... Price 25/–



Hornby E220 Mixed Goods Set (20-Volt Electric) ... ... Price 47/6



Hornby No. 3C Riviera "Blue" Passenger Train Set (Clockwork) Price 57/6



Hornby No. E220 Special Pullman Set (20-Volt Electric) ... Price 75/–

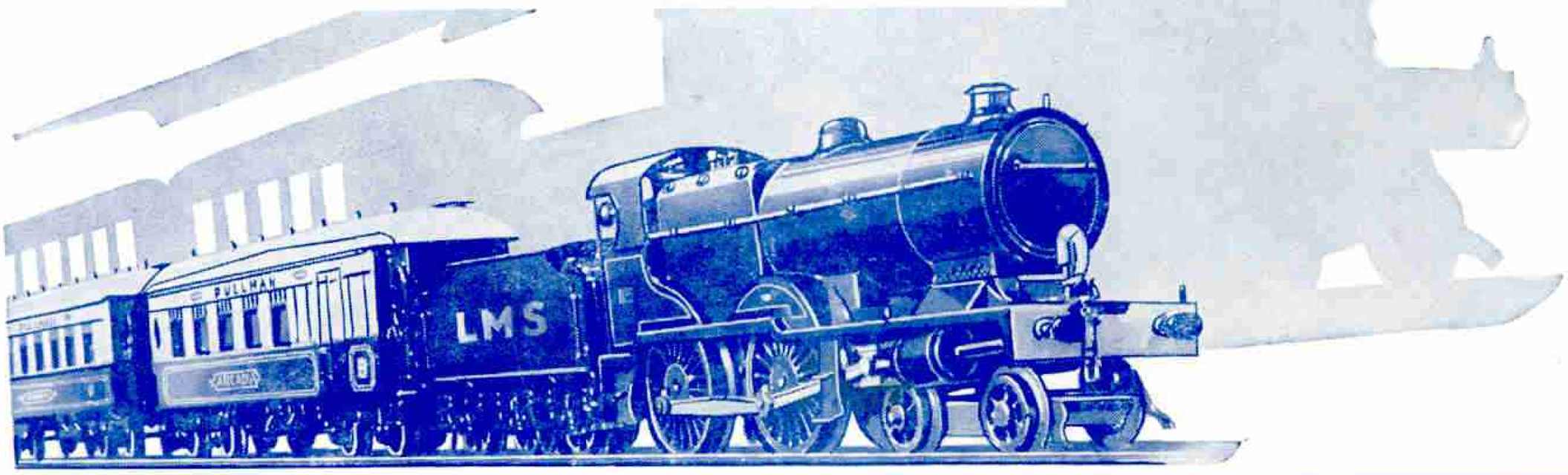
A selection from the range of HORNBY LOCOMOTIVES

ELECTRIC MODELS

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing) Price **8**/**6**
EO20 (20-volt) Locomotive (reversing) Price **22**/–
E120 (20-volt) Tank Locomotive (reversing) Price **24**/–
E120 (20-volt) Special Tank Locomotive (automatic reversing) Price **30**/–
E220 (20-volt) Special Tank Locomotive (automatic reversing) Price **32**/**6**
E220 (20-volt) Special Locomotive (automatic reversing) Price **37**/**6**

CLOCKWORK MODELS

M1/2 Locomotive (reversing) Price **4**/**6**
M3 Tank Locomotive (reversing) Price **7**/**6**
No. O Locomotive (reversing) Price **10**/**6**
No. 1 Special Locomotive (reversing) Price **17**/**6**
No. 2 Special Locomotive (reversing) Price **27**/**6**



The illustration below shows Hornby No. 2 Special Pullman Train Set with its true-to-type model of the L.M.S.R. "Standard Compound" class Locomotive bearing the number "1185."

EXTRA SPECIAL EDITION

CORONATION PLANS

Hamley's News

·HAMLEY·BROTHERS·LTD·ESTABLISHED·1760·

200-202, REGENT ST., LONDON, W.I. OUR ONLY ADDRESS
Telephone: REGENT 3161

No. 18 *March, 1937*

SPORT AND OUTDOOR EQUIPMENT

SEE CORONATION IN COMFORT

Suction Fixes Flag

For indoor celebration of Coronation small Union Jack on steel mast. Powerful suction cup at base of mast holds flag on any smooth surface, either vertically or horizontally, and avoids bother of special fixing. Post 2d. PRICE **1/-**

MEDICINE BALL BRINGS HEALTH

Stoutly made Medicine Ball will give many seasons' fun on the beach or any open space. Gives good bounce without being too light. (*Foreign.*) Post 9d. PRICE **12/6**

Binoculars for Junior

Adjustable focus. Magnification approximately two times. Leather covered body. Complete with leatherette carrying case and sling strap. (*Foreign.*) Post 6d. PRICE **5/6**

FOR 2/-

Ingenious folding periscope enables you to see over the heads of the crowd. Will give perfect view of procession without straining on tip-toe. Folds up very simply and takes up little space in your pocket.

Post 4d.

Cyclists Celebrate Coronation

For Coronation time many cyclists are fitting this attractive Union Jack. Special bracket takes only a few seconds to fix. PRICE **1/-** Post 2d.

SPORTOCULARS

These handy binoculars give sportsmen and sportswomen a permanent close-up of the game or race. Comfortable nose and ear-pieces banish the fatigue of holding glasses up to your eyes. (*Foreign.*) Post 6d. PRICE **6/6**

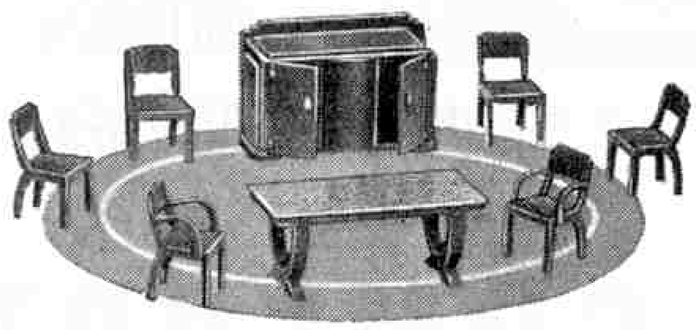
Find your way in the Dark

Transparent map reading Compass, has luminous points, agate bearing, and needle-locking device. (*Foreign.*) Post 3d. PRICE **4/9**

Dinky Toys

DOLL'S HOUSE FURNITURE

A WONDERFUL SERIES OF ACTUAL SCALE MODELS



DINING-ROOM FURNITURE

Dinky Toys No. 101 Price of complete set 2/3

No. 101a.	Table	5d. each
No. 101b.	Sideboard (Opening doors)	9d. „
No. 101c.	Carver Chairs	3d. „
No. 101d.	Chairs	2d. „

Supplied in walnut brown finish only.

BEDROOM FURNITURE

Dinky Toys No. 102 Price of complete set 2/11

No. 102a.	Bed	6d. each
No. 102b.	Wardrobe (Opening door) ...	9d. „
No. 102c.	Dressing Table (Opening drawers)	10d. „
No. 102d.	Dressing Chest (Opening drawers)	6d. „
No. 102e.	Dressing Table Stool	2d. „
No. 102f.	Chair	2d. „

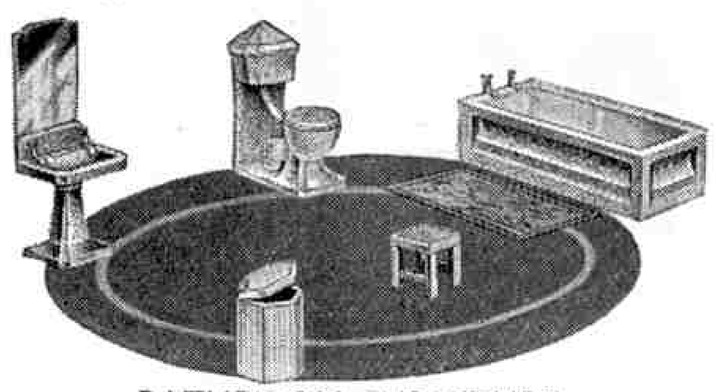
Supplied in colour or walnut brown finish.

KITCHEN FURNITURE

Dinky Toys No. 103 Price of complete set 2/6

No. 103a.	Refrigerator (Opening Door)	8d. each
No. 103b.	Kitchen Cabinet (Opening doors and drawer) ...	10d. „
No. 103c.	Electric Cooker (Opening door)	6d. „
No. 103d.	Table	4d. „
No. 103e.	Chair	2d. „

Supplied in two colour schemes—light blue and white; light green and cream.



BATHROOM FURNITURE

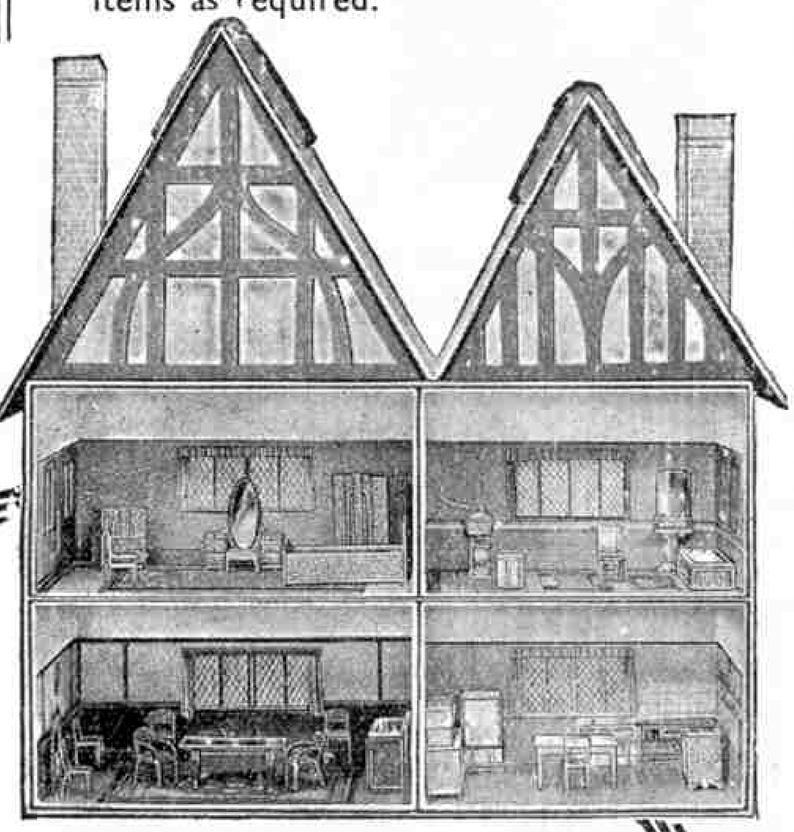
Dinky Toys No. 104 Price of complete set 2/–

No. 104a.	Bath 6d. each	No. 104b.	Bath Mat 1d. each
No. 104c.	Pedestal Hand Basin		6d. „
No. 104d.	Stool		2d. „
No. 104e.	Linen Basket (Opening lid) ...		4d. each
No. 104f.	Toilet (Lifting lid)		6d. each

Supplied in two colour schemes—pink and white; light green and white.

The jolly Doll's House Furniture that forms a special extension of the range of Dinky Toys has gained wonderful popularity. Every piece is a perfect miniature scale model based on a typical example of modern design, and with a beauty of finish that must be seen to be appreciated. All are made to a scale of 7/16th of an inch to one foot, which is as nearly as possible 1/27th full size. The different items of the four complete suites—dining-room, bedroom, bathroom and kitchen—are fascinating to handle, and there is a real thrill in manipulating the tiny opening doors and drawers.

Each of the suites can be bought either as a complete set or in separate items. It is thus possible to increase the size of any one set by adding more chairs or other items as required.



This back view of the Doll's House shows the four suites of Dinky Toys Doll's House Furniture tastefully arranged in position.

"DOLLY VARDEN" DOLL'S HOUSE

FOR DINKY TOYS FURNITURE

THE IDEAL GIFT FOR GIRLS

The "Dolly Varden" Doll's House provides a perfect setting for the Dinky Toys Doll's House furniture.

The exterior of the house is designed to represent a half-timbered dwelling, while the interior decorations, which are printed in nine colours, are in an attractive modern style.

Reinforced leather board is the material of which the house is constructed, and although it is collapsible it is as strong as a wood structure when set up. The container, which also is made of reinforced leather board, opens out to show a lovely garden with Tennis Lawn, Carriage Drive, and Rockery, providing an exquisite setting for play with Dinky Toys and Hornby Trees, Hedging, etc. The arrangement of the Dinky Toys Furniture, shown in the illustration on the right is intended only as a suggestion. Great fun is to be had from re-arranging the various items, perhaps on the lines of some familiar real rooms.

Price of "Dolly Varden" Doll's House—9/6

The Couch Hammock, Tennis Net, Garden Seats, Dinky Toys Garage, Motor Cars and Figures, and the Hornby Trees and Hedging featured in the illustration on the left are not included with the Doll's House and Garden.

DIMENSIONS

The following are the overall dimensions of the "Dolly Varden" Doll's House when built up ready for play. Length, 1 ft. 6¾ in. Depth, 10¼ in. Height, 1 ft. 6¾ in.

The open container on which the house stands measures 3 ft. 3½ in. by 2 ft. 5½ in.

When the house is dismantled and packed in container, the overall dimensions of the complete parcel are ¾ in. x 1 ft. 7½ in. x 2 ft. 5½ in.

MECCANO LTD. - BINNS ROAD - LIVERPOOL 13

World-famous **FROG** scale-models

Obtainable at all good toy-shops and stores

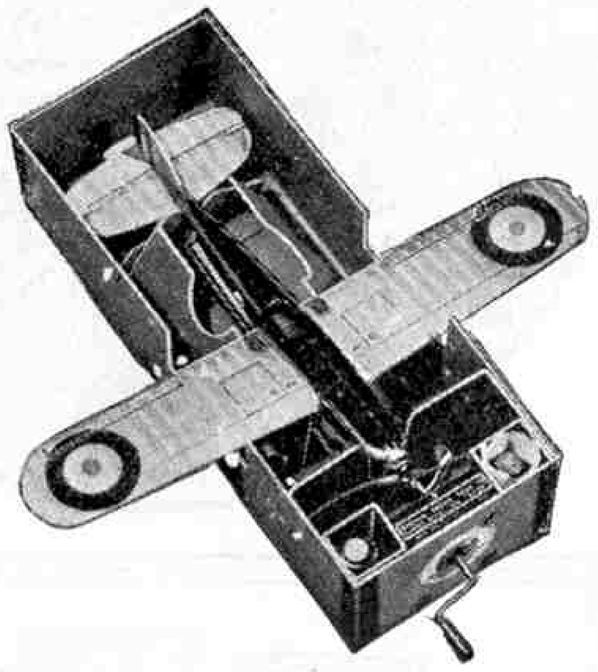
THE FLYING FROG MK IV

This illustration shows how quickly the Frog scale models are wound up for flight with the geared-up winder box.

A PATENT AND EXCLUSIVE "FROG" FEATURE.

FREE FLIGHT INSTRUCTION

Lines Bros. will give free flight instruction by appointment on the Frog Aerodrome at Merton. Telephone: Liberty 1041.



FROG MK IV INTERCEPTOR FIGHTER FLYING SCALE MODEL

All-metal Fuselage of Tubular Construction, Patent Detachable Undercarriage and Hollow Wings, Powerful Motor, coupled to a Precision-cut Gearbox, accurately carved Air-screw. Complete with Patent High-speed Winder Box, Motor Lubricant, Gearbox Oil, two spare Motors and Inserter Rod, and fully illustrated Flying Manual. Wing Span 11½". With practice will fly 300 ft.

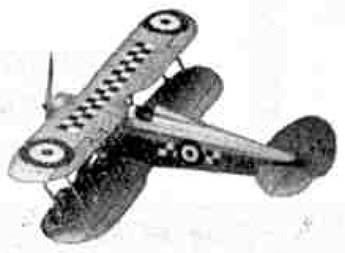
PRICE **5'-** EACH

THE FROG "PENGUIN" SERIES

Trade Mark Regd.

of realistic non-flying scale models

These FROG models are designed as non-flying scale models and can therefore be made to a degree of accuracy and detail otherwise unobtainable. Even the cross-sections of the wings, struts, etc., are to scale so that the model would give accurate results if tested in a wind-tunnel. The single-seater fighters are available with the markings of any of the leading fighting Squadrons, while the Blackburn "Shark" carries the insignia of H.M. Aeroplane Carrier "Courageous." The completed models are finished in the correct colours while the kits include **transfers, full-scale drawings, cements, etc. All parts are correctly shaped,** needing only to be assembled and the transfers added.



Gloster "Gladiator." Represents the last word in single-seater fighters to come into production. Model has a wing span of 5⅜".

CONSTRUCTION KITS 3'-
MADE-UP MODEL 6'6

Hawker "Fury." Probably the best-known fighting aeroplane in the world. Model has wing span of 5".

CONSTRUCTION KITS 3'-
MADE-UP MODEL 6'6

Blackburn "Shark." Latest and largest Torpedo Bomber in the Fleet Air Arm. Model has a wing span of 7½".

CONSTRUCTION KITS 5'-
MADE-UP MODEL 12'6

WATCH OUT! SIX NEW MODELS

Airspeed Envoy. Armstrong Whitworth "Scimitar." Avro 504 K.
De Havilland "Diana." Percival Gull. Short Singapore III Flying Boat.

FROG MODEL AIRCRAFT

All FROG model aircraft are covered by World Patents granted and pending. Made in England by International Model Aircraft Ltd.

Sole concessionaires:

LINES BROS. LTD., TRI-ANG WORKS
MORDEN ROAD, MERTON, LONDON, S.W.19

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19.

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force Pilot Badges.

Name.....

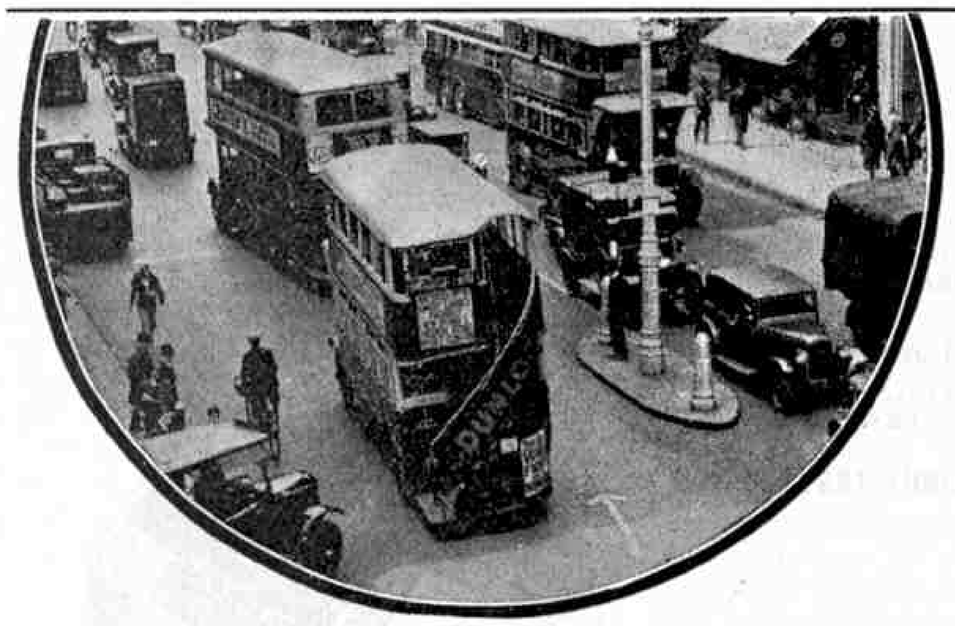
Address.....

.....

Please write in block letters. 3/37

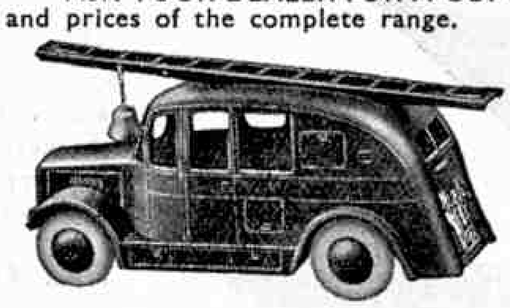
DINKY TOYS

A FASCINATING COLLECTING HOBBY

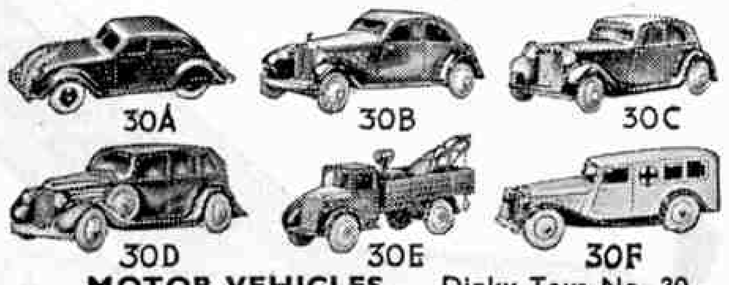


Dinky Toys are the most realistic and the most attractive models in min ature ever produced. These wonderful toys are unique in their perfection of finish, and their range is so wide as to appeal to all tastes. A selection is illustrated on these pages. As will be seen, trains, motor vehicles, aeroplanes, famous liners, etc., are already included in the range. Many other models of equal interest are in preparation.

ASK YOUR DEALER FOR A COPY OF THE DINKY TOYS FOLDER, which gives illustrations and prices of the complete range.



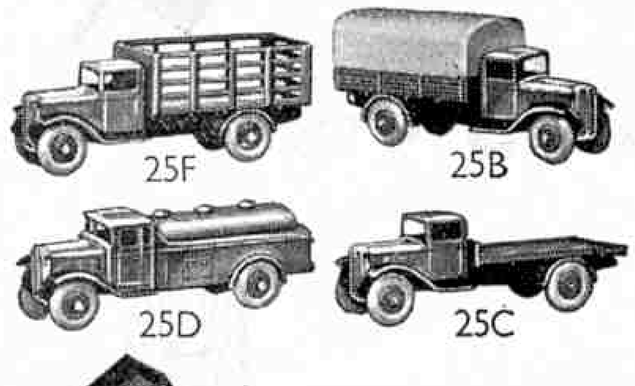
STREAMLINE FIRE ENGINE
Dinky Toys No. 25h
Fitted with detachable rubber tyres
Price 9d. each



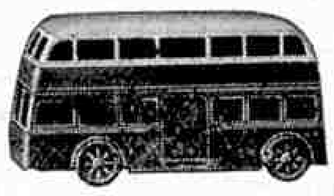
MOTOR VEHICLES Dinky Toys No. 30
Fitted with detachable rubber tyres and silver-plated radiators

No. 30a	Chrysler Airflow Saloon	each	9d.
No. 30b	Rolls-Royce Car	,,	9d.
No. 30c	Daimler Car	,,	9d.
No. 30d	Vauxhall Car	,,	9d.
No. 30e	Breakdown Car	,,	9d.
No. 30f	Ambulance	,,	9d.

Price of complete set 4/6

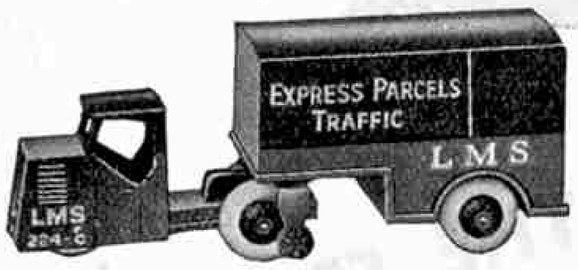


TRAM CAR
Dinky Toys No. 27
Assorted colours
Price 3d. each



MOTOR BUS
Dinky Toys No. 29a
Assorted colours
Price 4d. each

PILLAR LETTER BOX AIR MAIL
Dinky Toys No. 12b
Price 3d. each



RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Fitted with detachable rubber tyres

No. 33Ra	Railway Mechanical Horse	each	8d.
No. 33Rd	Trailer Van... ...	,,	10d.

Price, complete, L.M.S.R., L.N.E.R., G.W.R. or S.R., 1/6

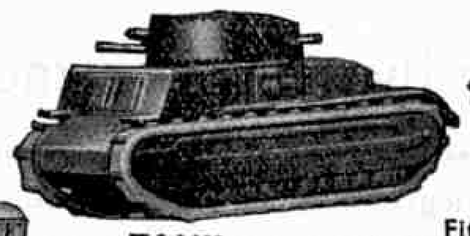
CUNARD WHITE STAR LINER "QUEEN MARY"
Dinky Toys No. 52a
Fitted with rollers and supplied in presentation box. Price 1/- each
Dinky Toys No. 52m
Similar to No. 52a but not fitted with rollers, nor supplied in presentation box. Price 9d. each

COMMERCIAL MOTOR VEHICLES
Dinky Toys No. 25
Fitted with detachable rubber tyres and silver-plated radiators

No. 25a	Wagon	each	9d.
No. 25b	Covered Van ...	,,	9d.
No. 25c	Flat Truck	,,	9d.
No. 25d	Petrol Tank Wagon	,,	9d.
No. 25e	Tipping Wagon ...	,,	9d.
No. 25f	Market Gardener's Van	,,	9d.

Price of complete set 4/6

STRONGLY MADE UNBREAKABLE MODELS



TANK
Dinky Toys No. 22f
Price 9d. each

DELIVERY VANS
Dinky Toys No. 28/1
Fitted with detachable rubber tyres

No. 28a	Golden Shred Van ...	each	6d.
No. 28b	Seccotine Van	,,	6d.
No. 28c	Manchester Guardian Van	,,	6d.
No. 28e	Firestone's Tyres Van ...	,,	6d.
No. 28f	Palethorpe's Sausage Van	,,	6d.
No. 28n	Atco Lawn Mowers Van ...	,,	6d.

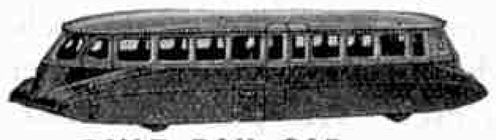
Price of complete set 3/-

A realistic model of the latest type of streamline train

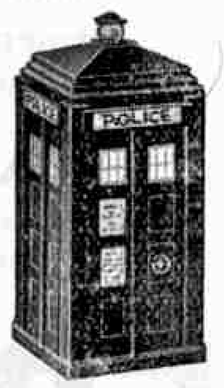
"SILVER JUBILEE" TRAIN SET
Dinky Toys No. 16
Price 1/6 each

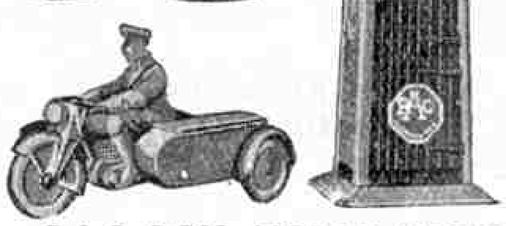
TRACTOR
Dinky Toys No. 22e
Price 9d. each

STREAMLINE SALOON
Dinky Toys No. 22h
Assorted colours. Fitted with detachable rubber tyres and silver-plated radiator. Price 4d. each



G.W.R. RAIL CAR
Dinky Toys No. 26
Assorted colours Price 4d. each

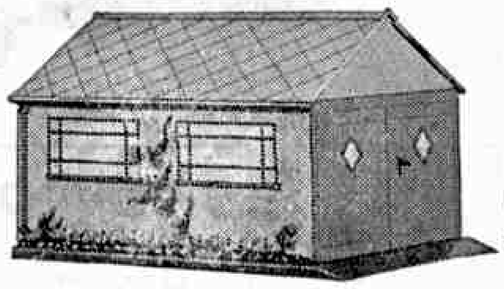




R.A.C. BOX, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 43
This set is representative of the familiar road hut and personnel of the R.A.C. Each item is finished in correct colours.

No. 43a	R.A.C. Box	each	6d.
No. 43b	R.A.C. Motor Cycle Patrol	,,	9d.
No. 43c	R.A.C. Guide directing traffic	,,	3d.
No. 43d	R.A.C. Guide at the salute	,,	3d.

Price of complete set 1/9



GARAGE
Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toys Motor Cars. Price 1/3 each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47a (Four face) Price 3d. each
No. 47b (Three face) Price 3d. each
No. 47c (Two face) Price 3d. each

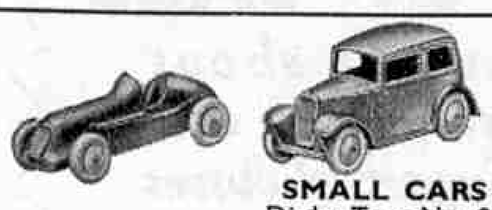
POLICE BOX, MOTOR CYCLE PATROL AND POLICEMEN
Dinky Toys No. 42

No. 42a	Police Box	each	6d.
No. 42b	Motor Cycle Patrol	,,	10d.
No. 42c	Point Duty Policeman (in White Coat)	,,	3d.
No. 42d	Point Duty Policeman	,,	4d.

Price of complete set 1/11

FINISHED IN RICH COLOURS

DINKY TOYS

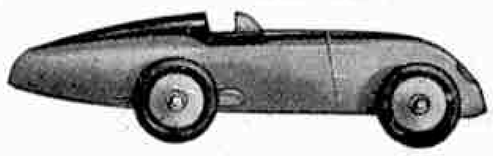


SMALL CARS
Dinky Toys No. 35
Fitted with rubber tyres

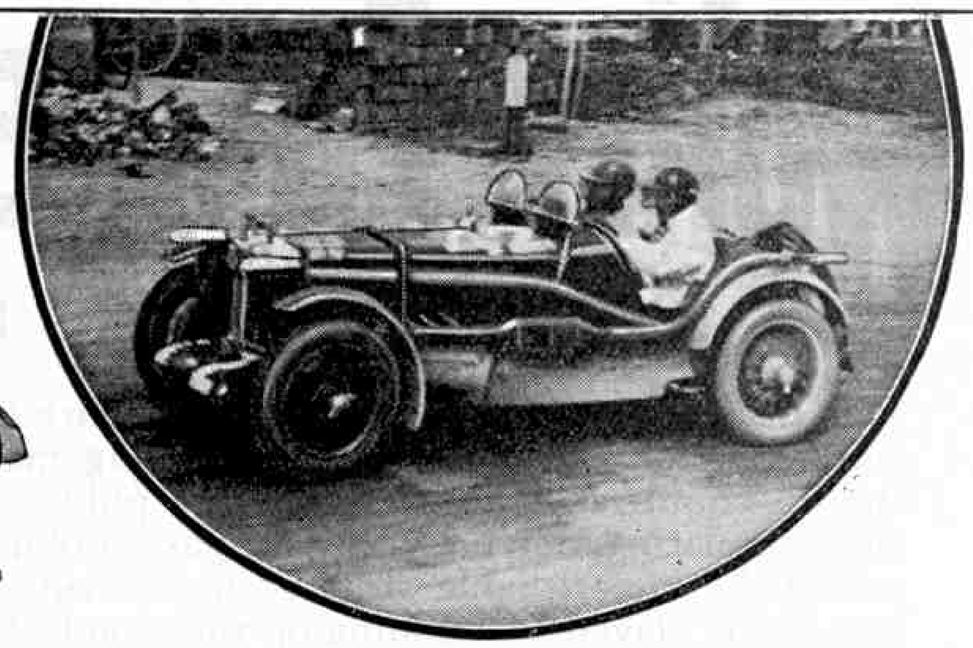
No. 35a	Saloon Car	each	3d.
No. 35b	Racer...	,,	3d.
No. 35c	"M.G." Sports Car	,,	3d.

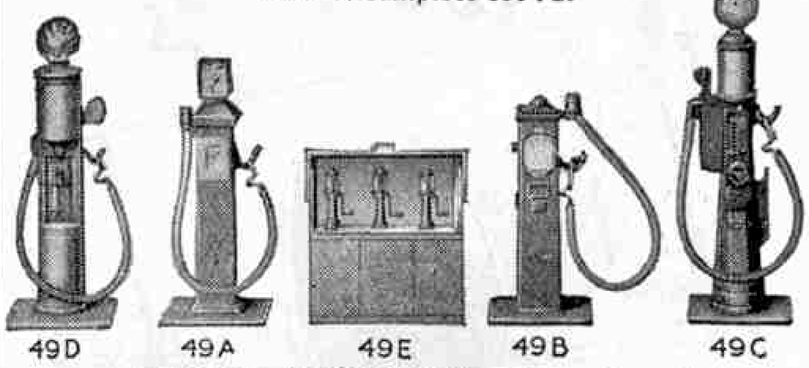
Price of complete set **9d.**

HOTCHKISS RACING CAR
Dinky Toys No. 23b
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each



RACING CAR
Dinky Toys No. 23a
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each



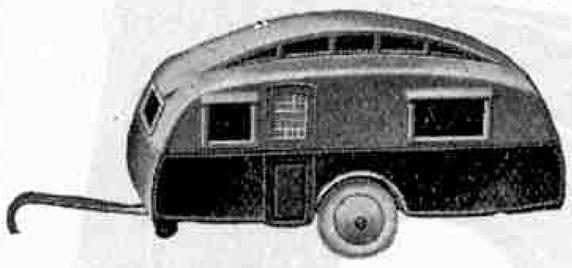


49D 49A 49E 49B 49C

PETROL PUMPS Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Realistically coloured.

No. 49a	Bowser Pump	each	3d.
No. 49b	Wayne Pump	,,	3d.
No. 49c	Theo Pump each 3d. No. 49d Shell Pump	,,	3d.
No. 49e	Oil Bin (Pratts)	,,	3d.

Price of complete set **1/3**



CARAVAN TRAILER
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For use with the Saloon Cars in Dinky Toys No. 24 and 30. Assorted colours. Fitted with detachable rubber tyres.
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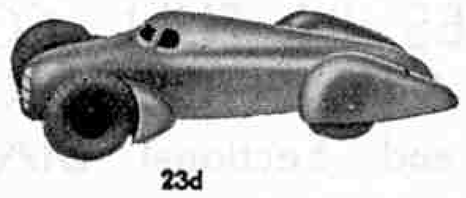
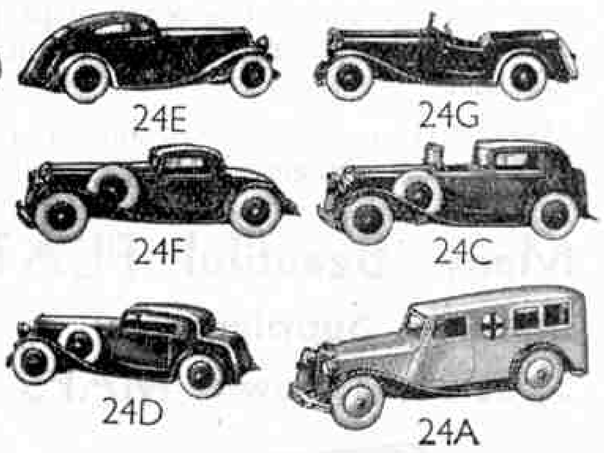
Dinky Toys No. 22g
Assorted colours. Fitted with detachable rubber tyres.
Price **4d.** each

23e



23d

23c



24E 24G 24F 24C 24D 24A 24H 24B

MOTOR CARS
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Fitted with detachable rubber tyres and silver-plated radiators

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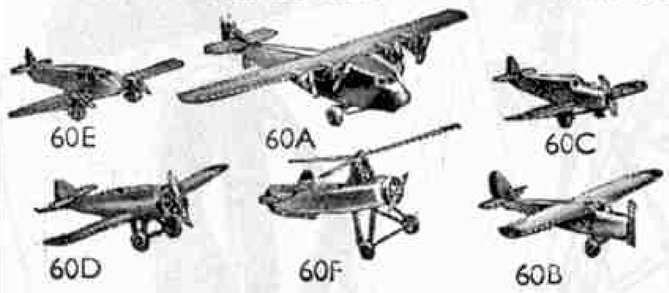
No. 24c	Town Sedan ...	,,	6d.
No. 24d	Vogue Saloon ...	,,	6d.
No. 24e	Super Streamline Saloon	,,	6d.
No. 24f	Sportsman's Coupé	,,	6d.
No. 24g	Sports Tourer (4 seater)	,,	6d.
No. 24h	Sports Tourer (2 seater)	,,	6d.

Price of complete set **3/11**

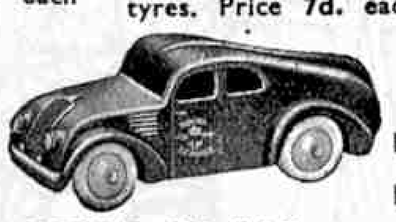


60E 60A 60C 60D 60F 60B

AEROPLANES Dinky Toys No. 60

No. 60a	Imperial Airways Liner	each	9d.
No. 60b	D.H. "Leopard Moth"	,,	6d.
No. 60c	Percival "Gull" ...	,,	6d.
No. 60d	Low Wing Monoplane	,,	6d.
No. 60e	General "Monospar"	,,	6d.
No. 60f	Cierva "Autogiro" ...	,,	6d.

Price of complete set **3/-**



ROYAL AIR MAIL SERVICE CAR
Dinky Toys No. 34
In correct colours. Fitted with detachable rubber tyres.
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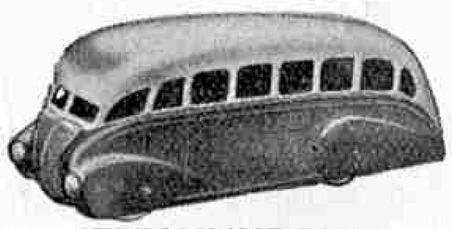
MOTOR TRUCK
Dinky Toys No. 22c
Assorted colours. Fitted with detachable rubber tyres. Price **6d.** each



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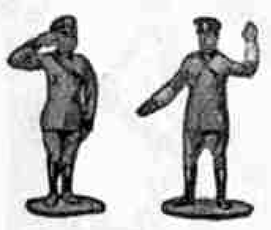
No. 23e	"Speed of the Wind" Racing Car	,,	8d.

Price of complete set **1/11**



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Each item is finished in correct colours

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33E 33B 33D

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Fitted with detachable rubber tyres

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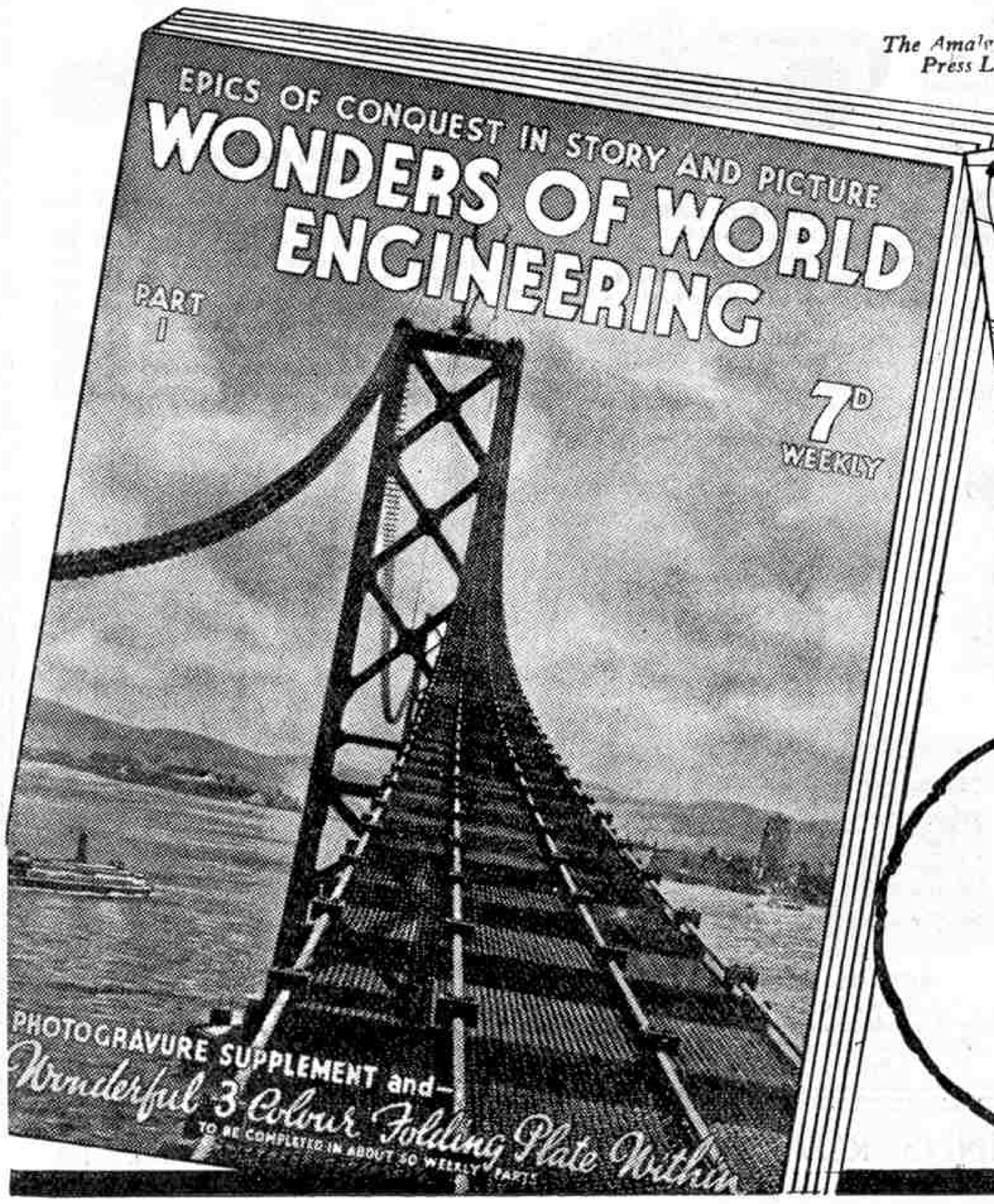

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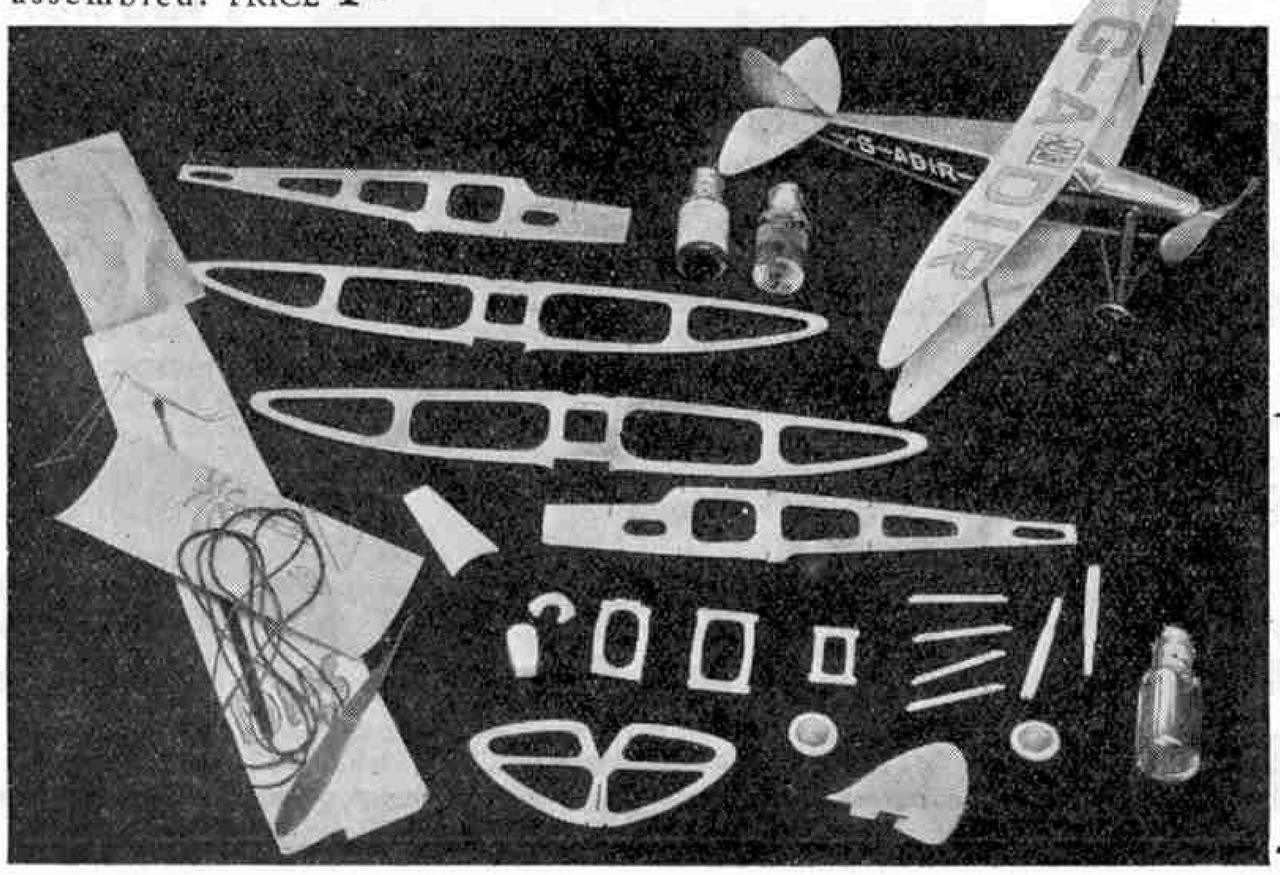

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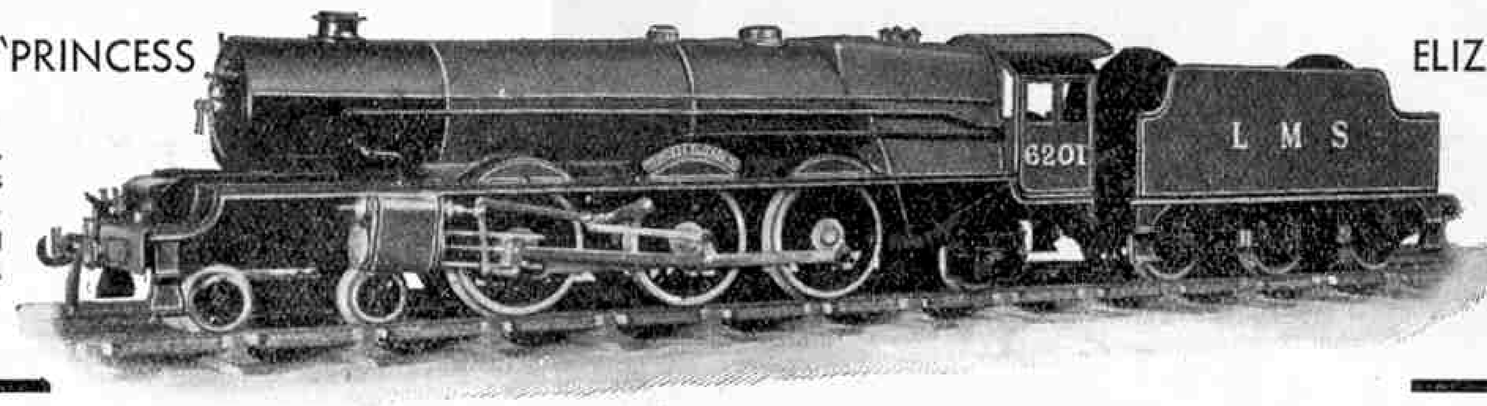

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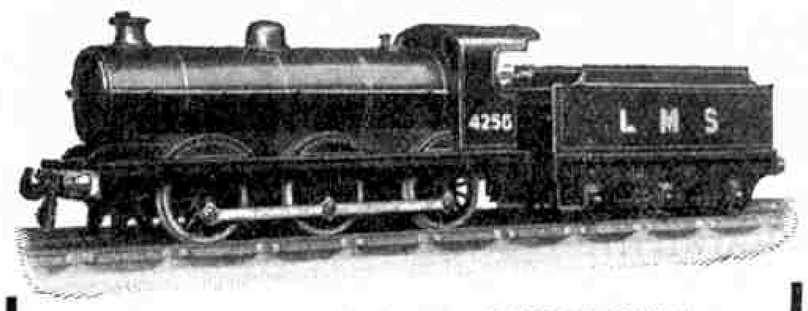

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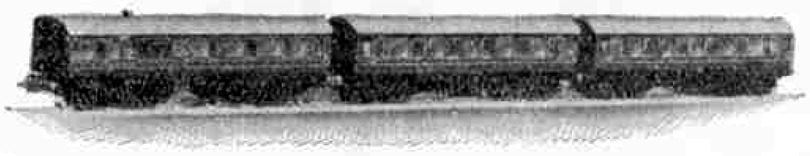

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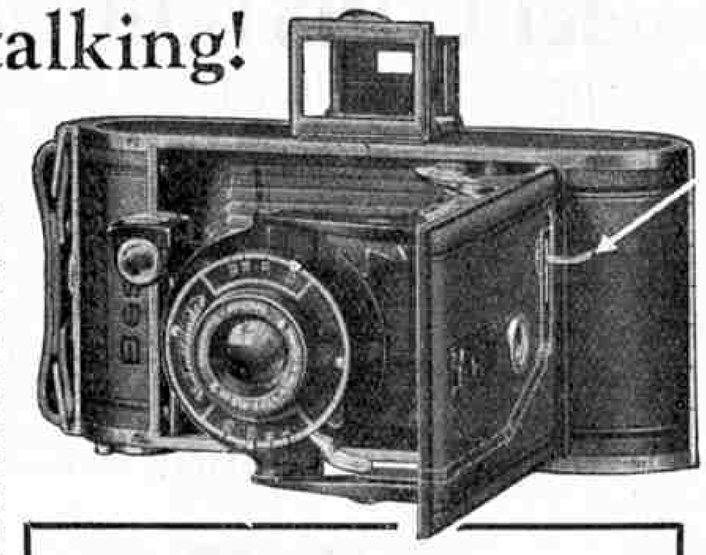

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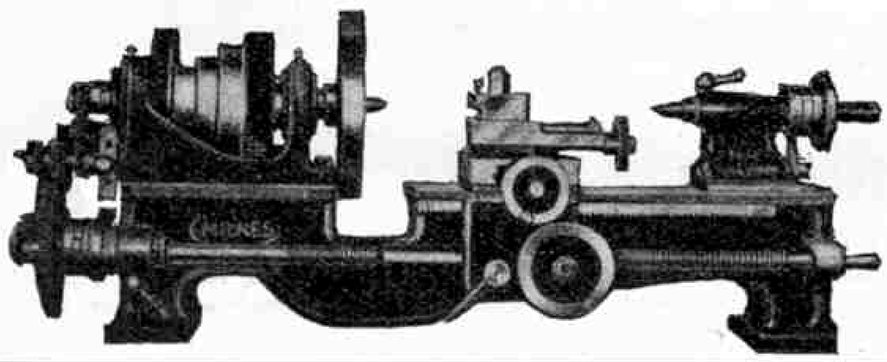

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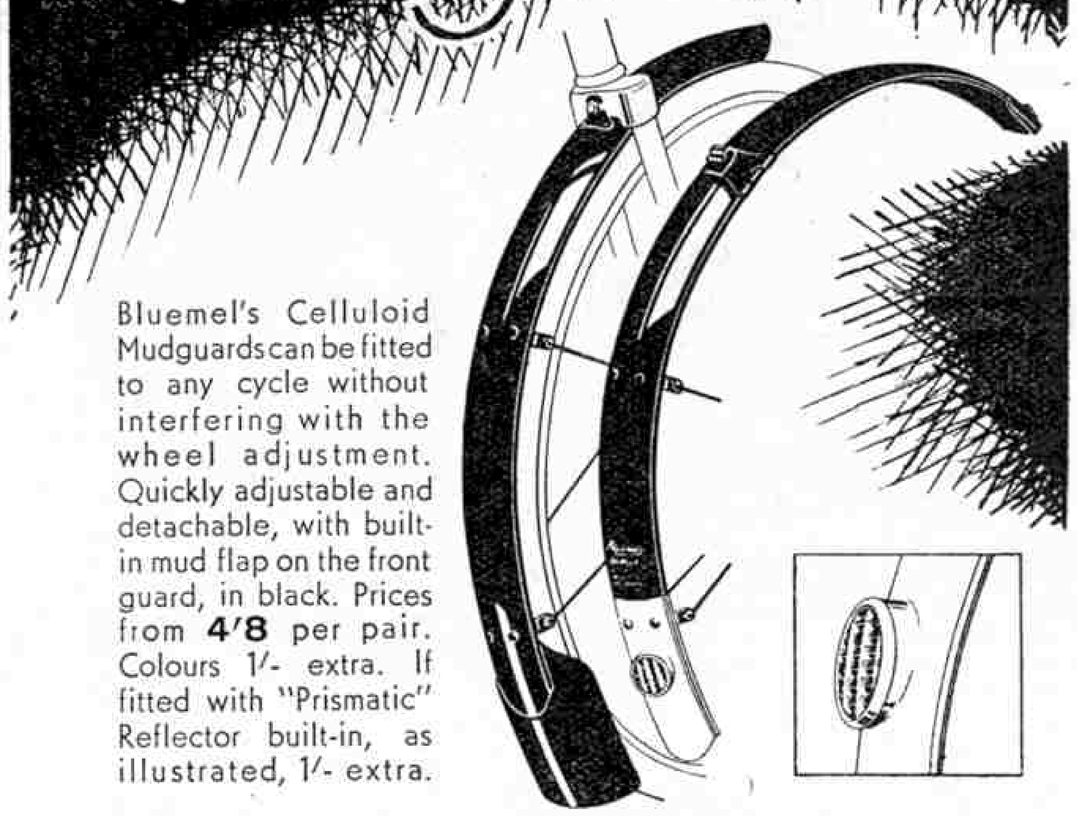

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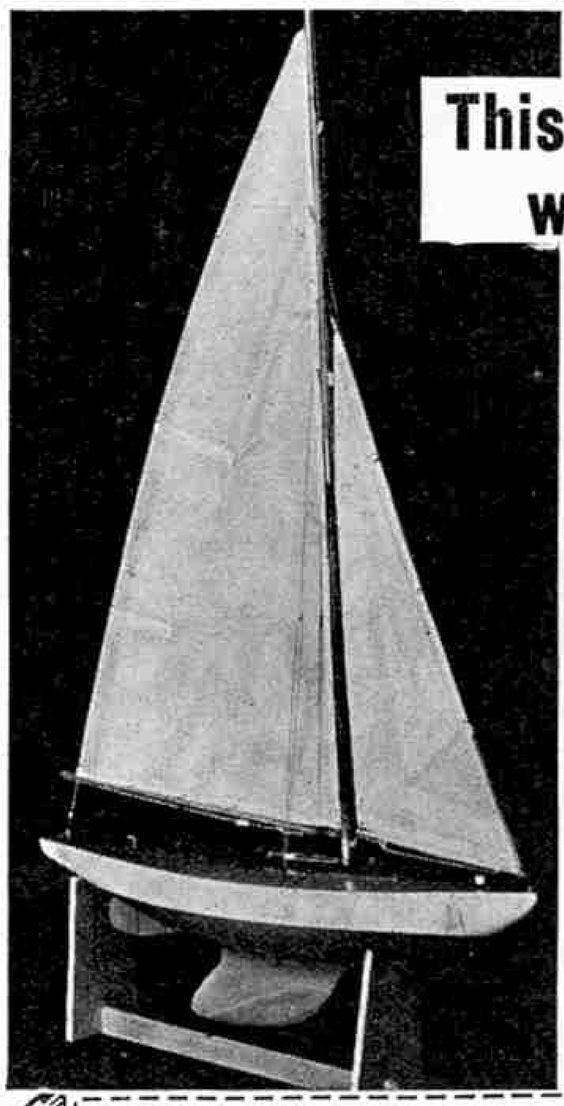

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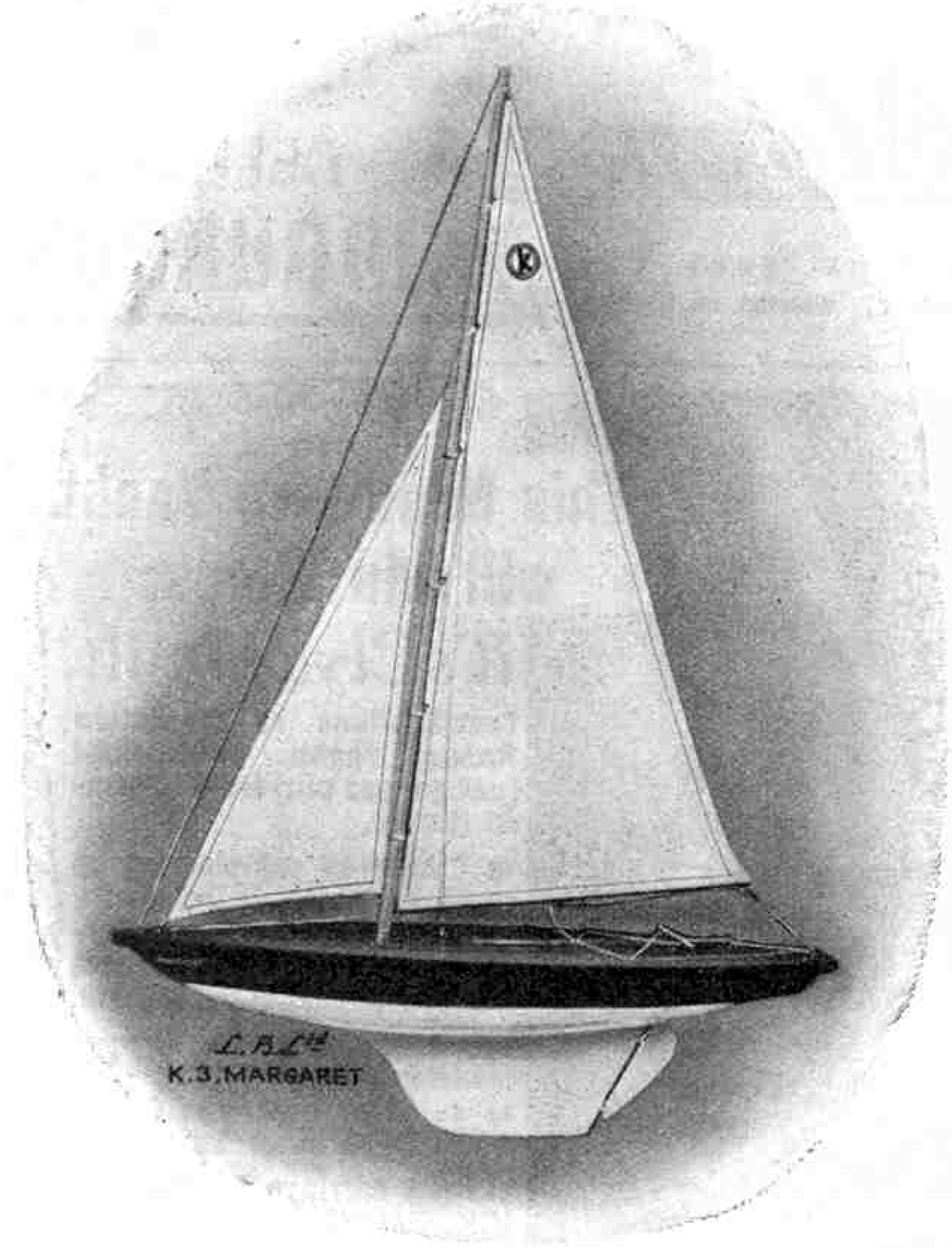

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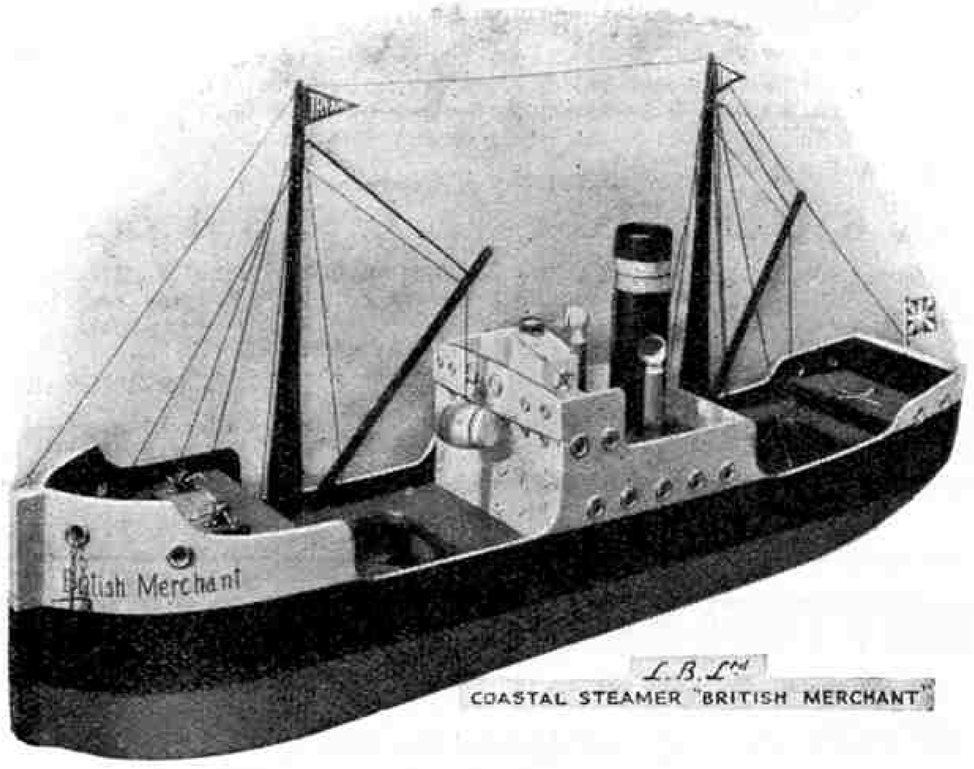

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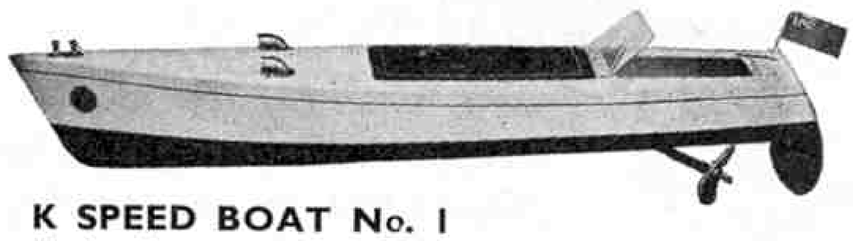

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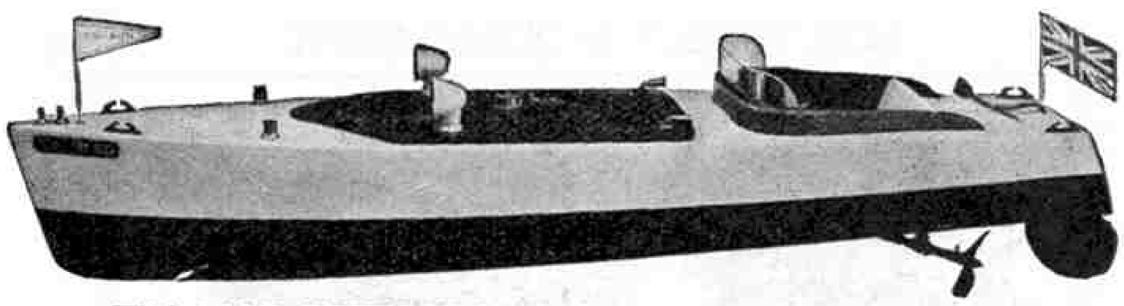
Fitted with powerful mechanism, windscreen, dummy ventilators, control lever and adjustable rudder. Hull 16 in. overall.



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Vol. XXII. No. 3
March, 1937

With the Editor

The Channel Crossing

This month I publish the first of two specially interesting articles by "Railway Engineer" on the Dover-Dunkerque train ferry. In his introductory paragraphs the author refers to the various efforts that have been made to produce ships that would give the greatest possible freedom from sea-sickness during the often unruly Channel crossing. The "*Castalia*" built about 1872, was 400 ft. long, with two hulls each with a beam of 20 ft., and spaced 35 ft. apart by very strong girders. The idea was that each of these hulls would act as a sort of outrigger to the other, so that the result would be a steady structure. The hulls were sharp at the ends, and had a draught of only 6 ft.; and each was fitted with a powerful engine for driving a large paddle wheel. There seems to have been some idea that this vessel might be suitable for carrying trains across the Channel, but no actual attempt to do so was made. The vessel was withdrawn from service after a short career, as she was much too slow to be of practical value. Another double-hulled boat of the same period, the "*Calais-Douvres*," was no more successful. In all essential features she was merely a larger and more elaborate version of the "*Castalia*," and was equally inefficient for Channel work.

The most elaborate attempt to eliminate sea-sickness was made by Mr., afterwards Sir, Henry Bessemer. He designed a vessel fitted with a large saloon carried on gimbals, the idea being that as the saloon was free to swing it would not be affected by the rolling of the ship. The actual result, however, was to produce a movement more trying to passengers than that of a normal ship. This vessel, which was named "*Bessemer*," attained a speed of 13½ knots, but was extremely difficult to steer and soon was abandoned.

Other weird and wonderful non-rolling vessels were proposed, but never reached the constructional stage; and soon it came to be realised that the normal type of ship was very difficult to improve upon in regard to the comfort of passengers.

If the scheme for a submarine tunnel to link up England and France had been carried out, the Channel crossing problem would of course have been completely solved. It is over 130 years since the idea of such a tunnel was first brought forward, and at one time it appeared as though it might be realised, in spite of the strong opposition aroused on both sides of the Channel. The Great War put a stop to any consideration of the matter, and since then international conditions have arisen that make it extremely unlikely that the tunnel will ever be bored.

National Parks in Great Britain

The excellent suggestion has been made that we should have National Parks in Great Britain. We could, of course, never hope to rival such countries as Canada and the United States in the extent of such natural playgrounds. In Canada the National Parks established in the Rocky Mountains, in the forests of Ontario and Quebec and elsewhere, have a total area of 12,000 square miles. The great National Parks of the United States, such as Yellowstone Park, famous for its hot springs and geysers, and the Grant and other parks in California in which are groves of the sequoia, the largest tree in the world, cover a still greater area. Even New Zealand, which is only a little larger than Great Britain, has reservations among its mountains and forests of 4,500 square miles. There is no lack of suitable areas in Great Britain, however. For instance, many parts of the Lake District would make excellent National Parks. There are also great tracts of wild and beautiful country in Yorkshire, Scotland and Wales that could quite well be preserved for ever in their present state

One interesting feature of many of the National Parks and reservations in other countries is that they afford refuge to wild animals that otherwise would soon be killed off. South Africa leads the way in this respect. The Kruger National Park has an area of 8,000 square miles, and in it such wild creatures as the lion, zebra, giraffe and hippopotamus find homes. Other parks have been established for elephants and various species of buck, including the rare bontebuck, of which only a single herd of 57 head has survived. Nothing could be more delightful than to travel through these immense parks and to meet in their natural surroundings animals that otherwise could only be seen occasionally in zoos and menageries. I hope shortly to publish an article on the South African National Parks, together with photographs of these wonderful remains of unspoiled Africa.

Silkworms, Bees and Caterpillars!

Those of my readers who are interested in natural history will enjoy the article on the rearing of silkworms that appears on page 154 of this issue. The farm described in this article is the only one of its kind in Great Britain, and this pioneer effort may lead to the foundation in the country of a new industry.

In succeeding issues I shall include other articles of a similar character. One of these will describe a wonderful butterfly farm at Bexley in Kent, and another will deal with the rearing of bees.

How a Modern Blast Furnace Works

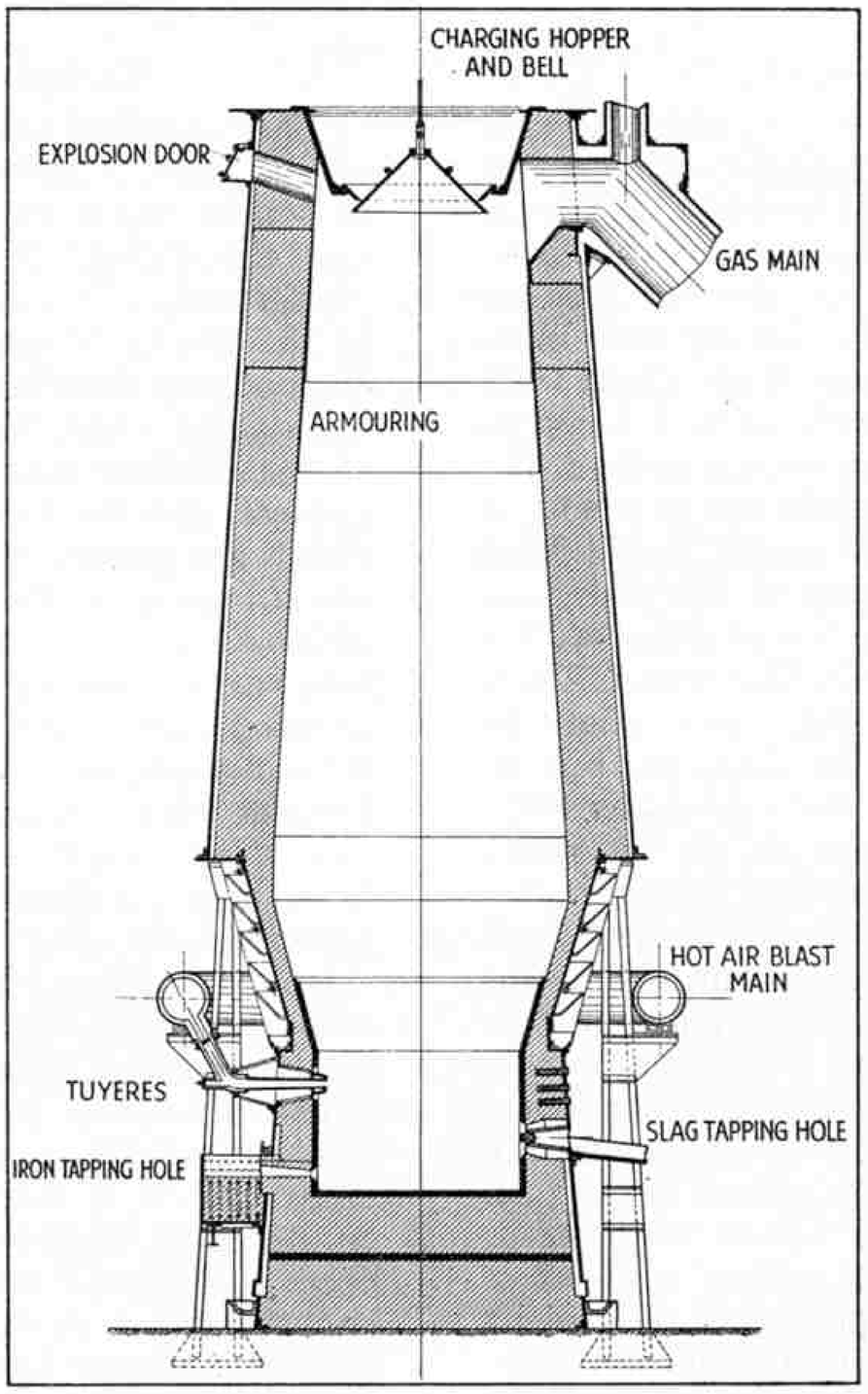
The Production of Pig Iron

OUR cover this month shows the blast furnace plant at the Works of The Park Gate Iron and Steel Company Ltd., situated on the outskirts of Rotherham, about seven miles from Sheffield. The works were founded in 1823, and are therefore one of the oldest established among the iron and steel producers of this country. The firm has always been in the forefront of technical development, however, and the plant to-day is modern and efficient and will bear comparison with any similar activity elsewhere.

For many years the products of the works were pig iron and puddled iron, but, with the advent of the Open Hearth process of steel manufacture, puddled iron gave way to the production of steel. To-day the works are planned to produce 3,000 tons of pig iron per week, and 6,000 tons of steel ingots. The steel is rolled in the plant and is supplied for many important purposes, as, for example among others, in the manufacture of deep pressings for motor cars, in providing material of special analysis that enables it to be machined at a very high speed, and in the provision of special steel sheets and sections that go for the building of the hulls of destroyers and other high speed sea craft. It is interesting to note that the steel plates for the construction of the boiler of the world's fastest steam locomotive, and the hull material of the world's fastest sea-going vessel, were supplied by Park Gate.

It is, however, with the production of pig iron that we are concerned at the moment. It is not often fully appreciated how important iron is in modern life. A few moments' thought will bring to mind that in our houses, in the street, in the means of transport, and indeed in all the services that go to make up communal life to-day, we depend on the use of iron. During 1936 the output of pig iron in Great Britain amounted to 7,685,700 tons; during the same period the world output amounted to 88,210,000 tons. These enormous figures give some idea of the magnitude of the industry we are considering.

Apart from very rare and isolated examples of meteoric metal, no iron exists in nature in metallic form. As we know from experience, iron exposed to the oxygen of the air is slowly converted to the oxide in the form of what we know as "rust." In the far distant past, long before Man made his appearance on the Earth, the original rocks forming the Earth's surface were shattered and disintegrated by the action of natural forces. The iron in the rocks was converted into iron oxide and, mainly through the agency of water, was carried to those places where it is found to-day, in the ironstone beds in the various parts of the earth. The known deposits throughout the world are very great, although many countries have no iron ore within their borders. In this regard Great Britain is favoured in that the known deposits of ironstone are large, and not far distant from the coal which, when coked, acts as the fuel in the smelting of the iron.

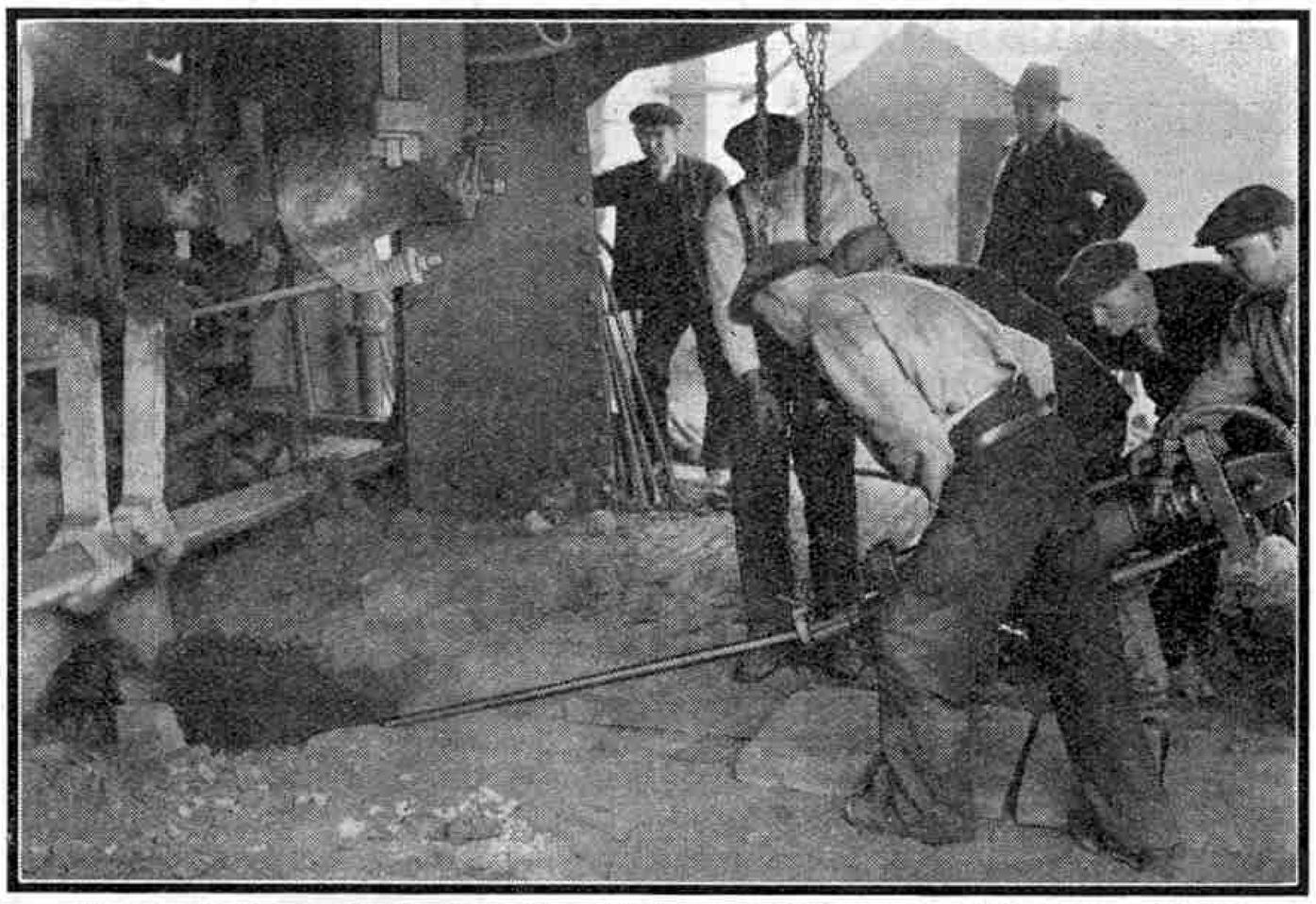


A diagram showing the parts of a modern blast furnace. For the illustrations to this article we are indebted to the courtesy of The Park Gate Iron and Steel Company Ltd.

If you refer to the outline drawing illustrating the blast furnace you will see that the steel shell is lined with firebrick, and that the interior of the furnace consists roughly of two cones joined at their bases. The diameter at the throat of the furnace is 12 ft. 9 in., the largest diameter, known as the bosh, is 19 ft. 6 in., and that at the lowest part of the furnace, known as the hearth, is 14 ft. The total working height of the furnace is about 65 ft., and the weight of material it contains is approximately 300 tons. Around the hearth of the furnace is arranged a number of jets about 5 in. in diameter, known as tuyeres, through which air is blown at a pressure of approximately 10 lb. per sq. inch. The air blast has been heated to a temperature of 1000 degrees F. or more by passing it through the hot blast stoves, the cylindrical erections seen on the left of the cover picture. These are fired by gases emitted from the furnace. The furnace is charged with coke—which, as already indicated, acts as the fuel—and with iron ore mixed with limestone. These are introduced mechanically at the top, which is so designed as to prevent the escape of gas; and it should be appreciated that the process is continuous. In other words, after the furnace has been started, it may not cease operating for several years.

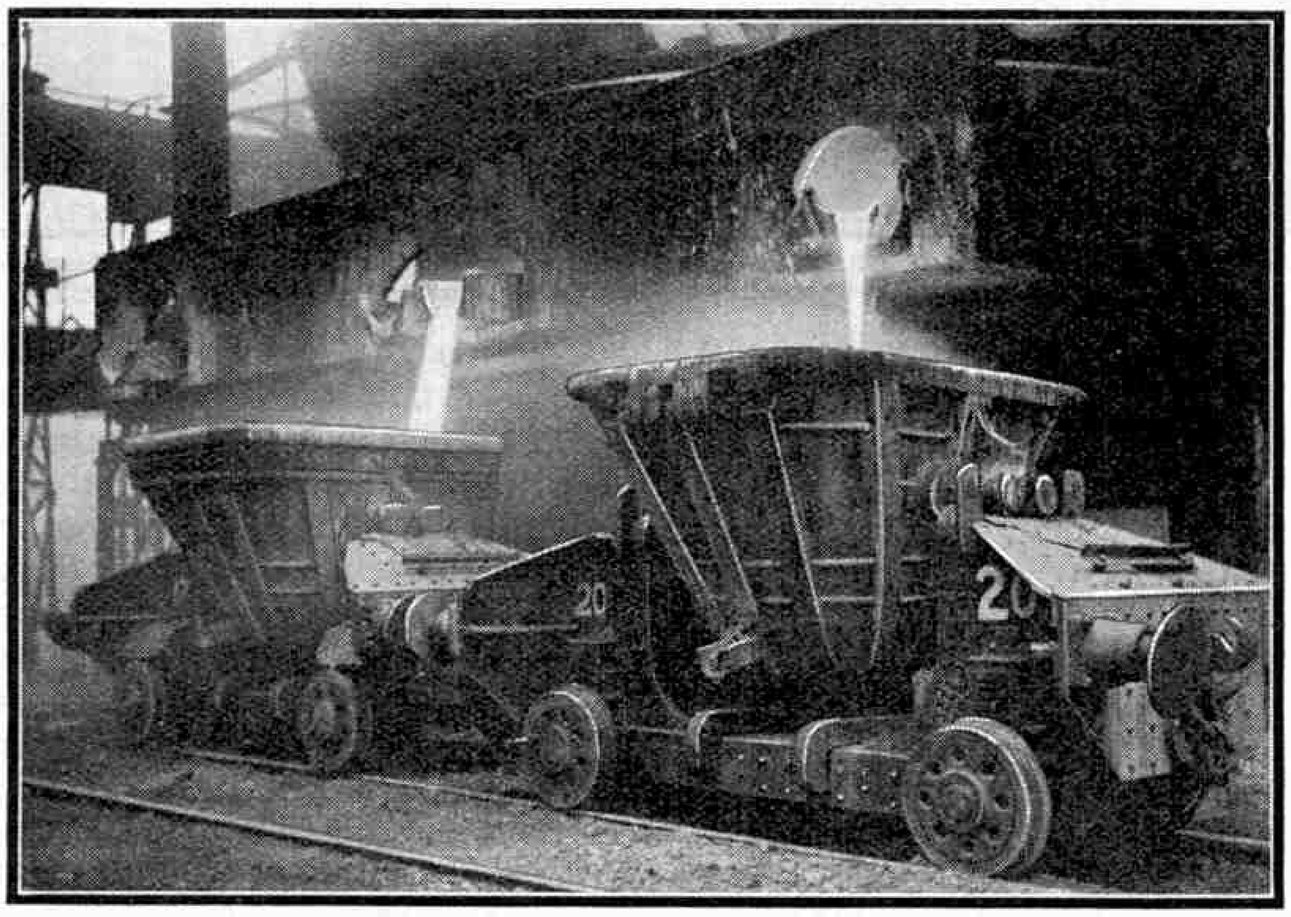
As already explained, the iron exists in the ore as iron oxide, but in the course of deposition as part of the geological strata of the earth it has become contaminated with other materials, such as silica, alumina, magnesia and sulphur; therefore the process of reducing iron from its ore has to provide also means for the removal of the non-metallic materials. This is done by the addition of limestone, which forms a flux with the impurities. It should be understood that the furnace is full of material from top to bottom. The introduction of the hot blast through the tuyeres

creates a high temperature owing to the rapid combustion of the coke. The temperature reached is probably of the order of 3,800 degrees F. At this temperature the reduced iron is molten, and as the flux, or slag as it is called, has a melting point lower than that of iron, it also is in a free flowing state. The specific gravity of the iron is greater than that of the slag, however, hence the metal falls to the bottom of the hearth while the slag floats above it. It is therefore possible from time to time to tap the slag through a suitable hole into slag ladles, in which it is transported from the furnace to the slag plant where, when cold, it may be crushed and tarred to form road-making material. The liquid metal is tapped at less frequent intervals than the slag, and it is either run direct into ladles in which it is carried to the steel works, or cast in the sand of the pig beds into what are known as "pigs."



Preparing for tapping a blast furnace. The molten iron is run into ladles, or cast in the form of "pigs."

In the foregoing description we have passed from the charging of the materials into the top of the furnace to the tapping of the iron and slag from the hearth; and it is now necessary to consider what occurs during the 13 or 14 hours that elapse between the introduction of the raw materials in the throat of the furnace and their arrival in the hearth. It will be understood that the combustion of the carbon of the coke with the oxygen of the air blast produces not only a high temperature, but also a large volume of carbon monoxide. There is present also the nitrogen of the air which, although inert chemically, nevertheless is heated up to the high temperature; as well as some hydrogen that is generated from the moisture carried by the blast. This volume of intensely hot gases moves up through the bosh and stack of the furnace, and in the process plays a very important function in the production of iron. It is mainly with the carbon monoxide that we are concerned, and this gas, when in contact with iron oxide at a sufficiently high temperature, has the power of abstracting the oxygen it contains, leaving behind metallic iron. The combination of the oxygen of the ore with the carbon monoxide converts some of the gas into carbon dioxide, and the gases leaving the appropriate outlet at the top of the furnace are a mixture of carbon monoxide, carbon dioxide, hydrogen and nitrogen. Hence, during the passage of the materials down the furnace, reduction is taking place by the aid of the gaseous products of combustion circulating among them on their upward journey; and the mass of material arrives in the bosh and hearth in a favourable condition for melting. The process is obviously a somewhat complicated one, but the essentials have been described, and from them, with the aid of the illustration, a clear idea should be obtained of what is taking place within the furnace.



Slagging at a blast furnace. The slag is tapped off into ladles that carry it to the plant in which it is made into road-making material.

All pig iron is not the same in quality, although the processes of smelting are similar. Some of the iron made is known as hematite, and this is used for steel making by the Acid Open Hearth process, and for the production of special castings. Another important quality is the foundry iron, which is used in the making of castings of all kinds. In this case the pig iron is melted in an apparatus somewhat like a small blast furnace, called a cupola, in which the iron and coke are charged at the top, and the iron is melted by the combustion of the coke in the hearth with the aid of air blast. The founding of iron is important and skilled work. The iron founder has to have knowledge of the quality of the iron to be used for the casting he is to produce. There are many different qualities of foundry iron, and these have to be judiciously mixed to give satisfactory results. The major output of pig iron, however, is known as basic iron, and this is used in the production of steel by the Basic Open Hearth process. A large proportion of the world's output of pig iron is of this quality.

It will be understood therefore how important it is to the community that pig iron should be produced as efficiently and as cheaply as possible.

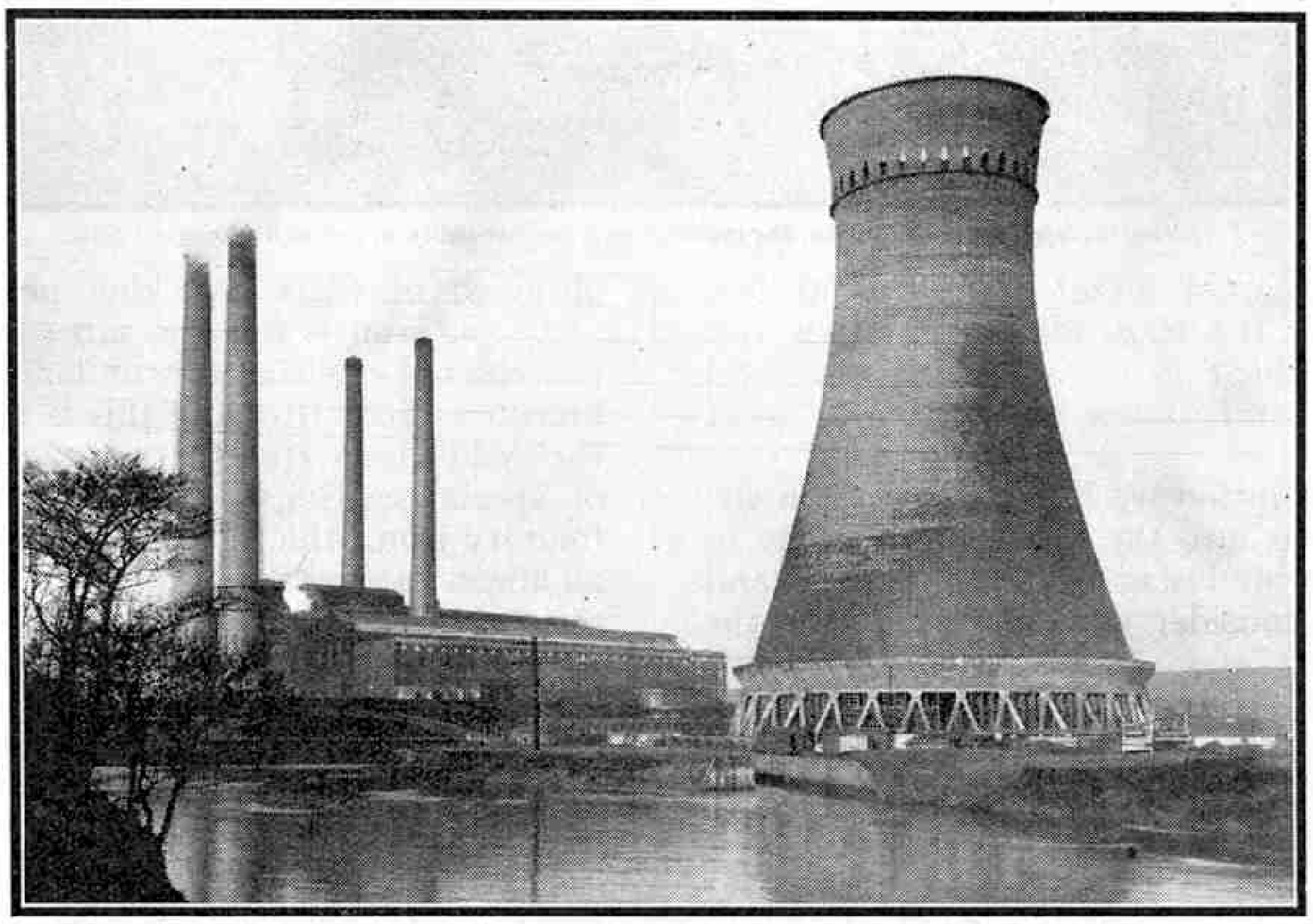
We are indebted to The Park Gate Iron and Steel Company Ltd., for valuable assistance in the preparation of this article and of our cover illustration.

The World's Largest Cooling Tower

A Lancashire Electric Power Station

A NEW 50,000 kW generating set, with its associated plant, was opened in December last at the Kearsley Power Station of the Lancashire Electric Power Company. This Company operates in an area of 1,100 sq. miles in south Lancashire, supplying electricity wholesale to many important authorities, and distributing supplies to nearly 50,000 consumers of all classes.

The installation of the new set marks a stage in a remarkable story of expansion. The Company began in 1905 with a small power station at Radcliffe, from which three million units was sold in 1906. As the network of cables carrying current in the Company's wide area grew, the demand increased and extensions became necessary as early as 1911. Since then there has been continual expansion. In 1905 there were six feeders, or main cables, radiated from the Radcliffe Station, but to-day more than 100 feeders are in use. The entire high tension system extends nearly 800 miles, and the low tension network covers more than 1,000 miles of streets and roads. More than 70 textile mills, whose requirements represent 40,000 h.p., are supplied, in addition to a wide variety of other industrial concerns, and the estimated total sale for 1936 was in the neighbourhood of 550 million units.



Kearsley Power Station. The cooling tower on the right is the largest of its kind in the world. The illustrations to this article are reproduced by courtesy of The British Thomson-Houston Co. Ltd., Rugby.

In order to meet the ever-increasing demands for light and power, the original station at Radcliffe was extended, and then was supplemented by a new one erected at Padiham in 1926, which was followed by a third at Kearsley in 1929. The two additional stations set up new records in turn for low coal consumption and thermal efficiency, and all three power stations of the Company were approved as "selected" stations when the Grid scheme of the Central Electricity Board was launched.

When the first part of the Kearsley station was opened in 1929, it was designed to accommodate four 32,000 kW turbo-generators and 16 boilers, each capable of evaporating 75,000 lb. of water an hour. Two generators and eight boilers actually were installed and put to work in September 1929. Five years later the boilers were increased in capacity to give 95,000 lb. of steam an hour by installing water cooled furnaces. It was intended that extensions would be made by adding the two further units of 32,000 kW originally designed. In the meantime the Central Electricity Board came into existence, however, and the greater requirements of the Board made it necessary to plan additional units of 51,600 kW, with boilers having a normal rate of evaporation of 150,000 lb. of steam per hour. The first of these new sets is the one opened in December, and work on the second is now in progress.

The new turbo-generator weighs over 200 tons, and at normal load develops about 70,000 h.p., the electrical equivalent of which is 51,600 kW. Current is generated at 33,000 volts, and the set is the largest in the country generating current at that high voltage. The overall length of the machine is 90 ft., and its cost, without any foundations, buildings, pipework and cables is about £170,000.

The giant turbo-generator requires very large quantities of steam to operate its turbine. This is supplied to it by four huge boilers, each of which has a maximum rating of 173,000 lb. of steam an hour. The pressure at which the steam works is 620 lb. per sq. in., and its temperature is 850 deg. F. Three of the boilers are sufficient to give the maximum output from the turbine, and the fourth is a spare unit.

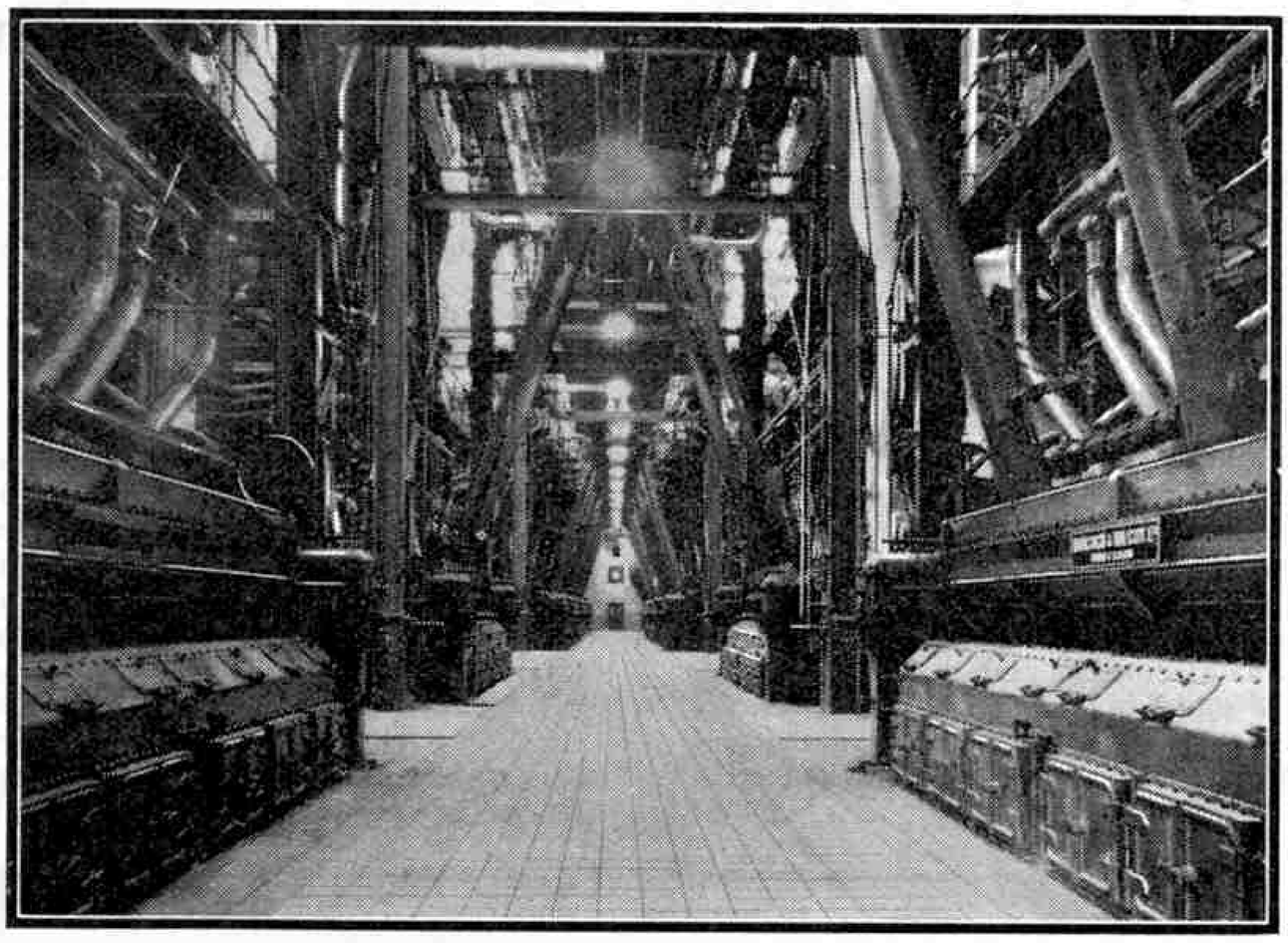
The furnaces are fitted with Bailey walls, which consist of tubes cooled by water. Cast iron blocks are attached to the furnace side of these tubes, forming a continuous wall of metal around the entire furnace. With this type practically no upkeep is required.

Coal is delivered by rail to the Company's sidings, and hauled into the station by electric locomotives. After it is tipped out of the wagons it is elevated by bucket conveyors to a large coal bunker above the boilers, from which it descends to the furnace. There it falls on to mechanical stokers of the travelling chain grate type, which carry it into the furnace itself. Two grates are fitted under each boiler. Each is 25 ft. wide and 20 ft. long, and they supply about eight tons of coal to each boiler every hour.

The ash falls off the rear ends of the travelling grates into chutes, at the bottom of which it is quenched with water in order to avoid producing dust. Special plants then deliver it into skips suspended from a monorail connected to an aerial ropeway, which delivers them to a hopper to be carted away. No mound or deposit of ashes is allowed to accumulate at the station. Instead the residue is carried away for delivery to a plant that uses it in the making of cement bricks. The new plant is so well

designed that the efficiency of generation is approximately 16 per cent. above that of the turbo-generators previously installed.

The station is a large imposing building, with four huge chimneys rising above it. The most striking feature is an immense tower on the opposite bank of the Irwell, however. This has been built for cooling purposes and is the largest of its kind in the world, both in regard to its actual size and the quantity of water cooled in it. It is 260 ft. in height and 175 ft. in diameter at the base, and is capable of cooling 3,370,000 gallons of water per hour.



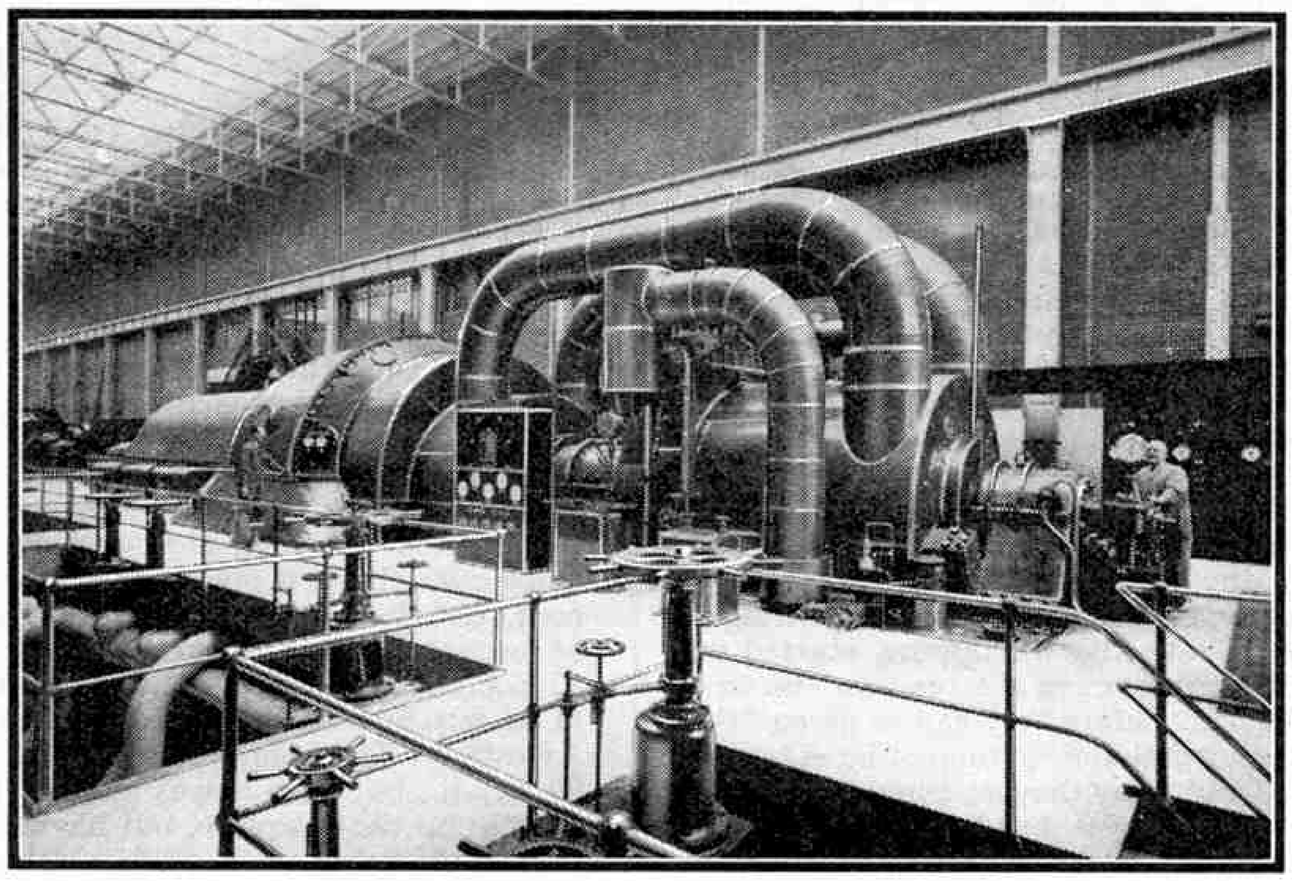
The firing aisle in the boiler house. Coal is fed to the furnace hoppers through long straignt cnutes from coal bunkers on the floor above.

This huge quantity of water is required to deal with the steam after it has done its work in the turbines. The greatest care has to be taken in regard to the water evaporated in boilers of this kind in order to prevent furry deposits or corrosion. Pure water therefore is used, and the steam is condensed, and the water thus produced passed back into the boiler, in order to go through the cycle of operations again. An elaborate pumping system is required to deliver the feed water to the boiler, for a pressure of 620 lb. per sq. in. has to be overcome, and the quantity passed through must be equal to that evaporated, that is about 180 tons an hour, or a hundredweight every second.

The great tower is used indirectly to cool the steam in order to condense it. In the condenser the cooling is carried out by passing the steam over thousands of tubes through which cold water is circulated by means of pumps. A very large quantity of water is needed because the steam must be condensed quickly in order to make room for that following it through the turbine, for otherwise back pressures that would be set up would stop the turbine from running or slow it down. Water from the Irwell is pumped through the condenser, and a river intake and plant for screening off foreign materials have been installed for this purpose. In summer the quantity of water in the river is insufficient, however, and then it is necessary to use the same water for cooling over and over again. For this purpose it is passed through the cooling tower, which is so large that it is capable of doing the whole of the work, making reliance on the water of the Irwell unnecessary.

The tower stands in an immense tank of water about 8 ft. deep. Its lower part is of open trellis work, through which air can enter, and at a height of about 25 ft. is an immense trough or culvert passing right round the structure. Hot water from the condenser is led away through pipes 4 ft. in diameter. These pipes pass through a tunnel from the turbine house to the bank of the Irwell, and cross the river on a steel bridge. They lead to the culvert, from which the water flows into the tower, where it falls through a series of troughs into the tank in the base. On its way it is spread out over a grid built up of wooden slats, and is cooled by the air drawn into the tower through the lattice work at its base. The necessary upward draught is created by the heat from the circulating water, the tower itself acting as a chimney. Thus the water is cooled, and by the time it reaches the tank it is ready to be pumped back again through the condenser. There is a certain proportion of loss due to evaporation of the hot water, but the small amount required to make good this loss is easily obtained from the river. The pumps that circulate the water are installed in a pump house situated near the tower.

The utmost care is taken to ensure that all materials used are exactly what is needed, and tests are carried out regularly in the laboratory which is equipped with the most modern apparatus for the analysis and testing of fuel, water and oil. In addition to the Company's own tests, important work has been carried out in the laboratory in connection with emissions from chimneys.



The 50,000 kW set in the turbine house. It generates current at 33,000 V and is the largest machine in the country generating at this voltage.

The total capacity of the Kearsley Power Station when the extensions are completed will be 167,000 kW or approximately 220,000 h.p. Coal consumption will then be in the neighbourhood of 500,000 tons per year, or over 1,300 tons a day. The present output of the station is 100,000 kW, and the coal consumption is approximately 1,000 tons per day. The production of this quantity of coal is sufficient to provide employment for over 1,300 miners.

We are indebted to the Lancashire Electric Power Company for information contained in this article.

A Famous L.N.E.R. Newspaper Train

"Sandringhams" Provide Footplate Thrills

By a Railway Engineer

THE night expresses of this country are mostly timed at quite moderate speed; distances are comparatively short, and with fast running such as that of the day trains between London and the north it would mean either a very late start or an uncomfortably early arrival for passengers. But a most remarkable exception to this general rule is the L.N.E.R. 2.32 a.m. newspaper express from Marylebone to Nottingham. With this train speed is of paramount importance to ensure that the London daily papers shall be on the breakfast table in homes all over the Midlands. I was recently privileged to ride on the footplate of this interesting train, and for sheer thrills I have never experienced the equal.

It is not only the fastest train on the Great Central section, but taken all the year round it is considerably the heaviest as well. On my trip the load was one of eight big vans and one coach for passengers. By 1.30 a.m. Marylebone was a scene of tremendous bustle. Van after van rushed in from Fleet Street packed with newspapers still damp from the press; before long the rear vans of the train were piled literally to the roofs, and loading-up went on at an ever-increasing rate as departure time drew nearer.

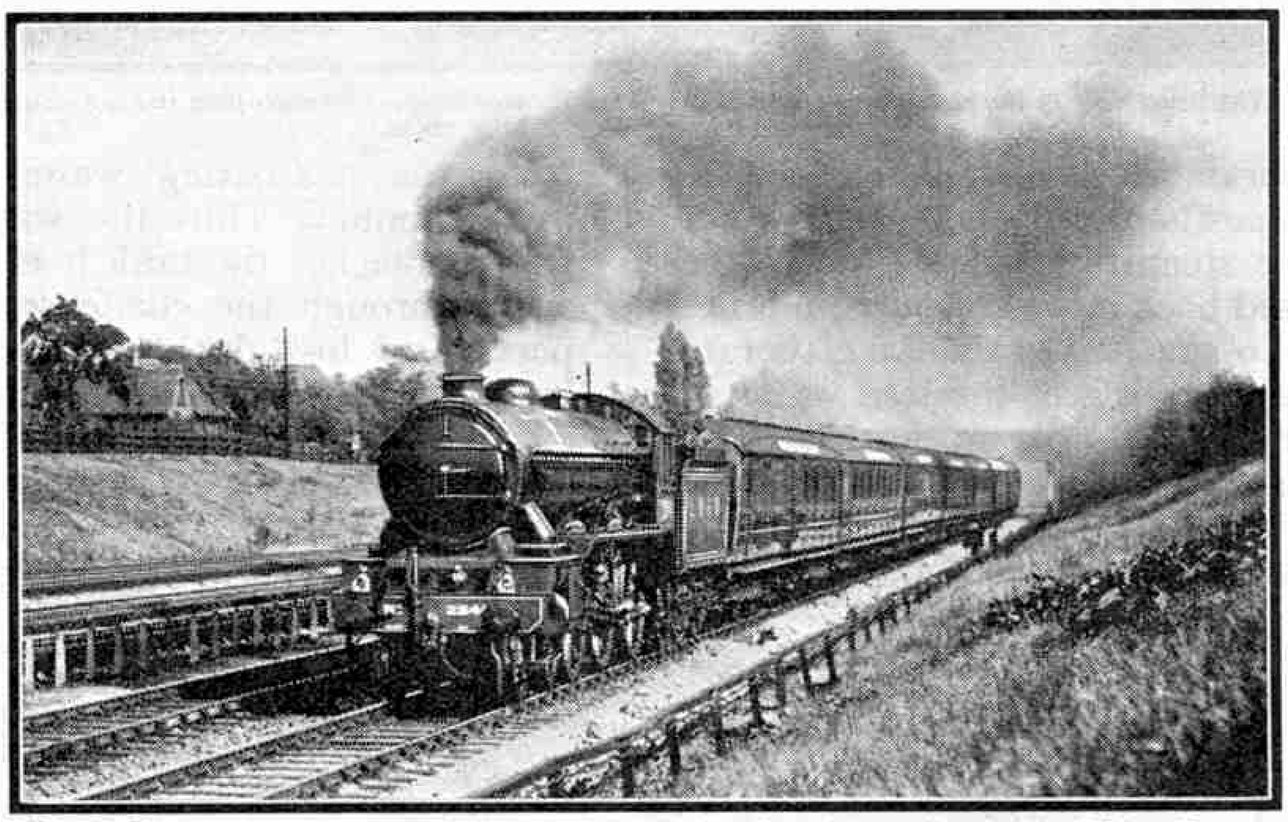
About 2.15 a.m. the engine came backing down; this was No. 2841, "*Gayton Hall*," a "Sandringham" class 4–6–0 in charge of Driver Simpson and Fireman Wood of Neasden shed. The cabs of these engines are very similar to those of the L.N.E.R. "Super-Pacifics," the most noticeable difference being in the reversing screw, which is arranged horizontally instead of vertically as in the 4–6–2s. The regulator is of the same pull-out type with handles on both sides of the cab, and a steam chest pressure gauge is provided.

2.30 a.m.! A last van raced into the station. Stacks of papers were loaded with lightning dexterity, and then on the stroke of 2.32 the van doors were slammed to, a green light shone far down the platform, and we were off. The vans weighed 271 tons, but this morning there were 30 tons of papers on board, so that No. 2841 had a load of fully 300 tons behind her tender. This train takes the shorter of the two alternative routes from Marylebone to the north, via Aylesbury, and is booked to cover the 59.3 miles from London to Brackley in 67 minutes start to stop, a very fast timing in view of the heavy grades of the Metropolitan Joint line.

Directly we got the "right away" the engine was opened straight out to full regulator and, without a vestige of slipping, started off just like an electric train. Most engines, even the readiest starters, usually need quite a lot of humouring before they can be given "the lot," but it is not so with the "Sandringhams"; you just have to pull the regulator right out to the full and away they go! Simpson started off in full forward gear, 65 per cent. cut-off, but he began notching up as soon as we were under way, and on entering the tunnel under Lord's cricket ground, barely a mile from the start, the engine was working at 35 per cent. cut-off.

All through the tunnel the line is rising, and the driver was continually applying sand to guard against the chance of the engine slipping. But "*Gayton Hall*" was pulling magnificently; the roar of the exhaust reverberated from the tunnel walls, the atmosphere became thick with flying coal dust, and the fire, drawn into a fierce white heat, threw a beam like a searchlight on to the roof. There is a short break in the tunnel where the L.N.E.R. crosses the L.M.S.R. main line from Euston, at South Hampstead station, and here No. 2841 was notched up to 25 per cent. cut-off. Still climbing at 1 in 100, we emerged from the second tunnel at 33 m.p.h., but in the last mile to Brondesbury summit the grade steepens to 1 in 95, and here we fell to 32 m.p.h.

Now cut-off was brought right back to 15 per cent. Accelerating like lightning through the sleeping suburbs—it was astonishing to see hardly a light among miles of dwellings—we swept through Neasden at 70 m.p.h., and took the two-mile rise at 1 in 95 to Harrow without speed falling below 53 m.p.h. The regulator was eased slightly as we ran through the station, but the moment we were over the north curve Simpson opened out to the "full" again, and we romped over the sharp ups and downs through Metro-land in most dashing style. Touching 66 through Pinner, we were up the two miles at 1 in 200 to Northwood at a minimum of 59, and two minutes later we stormed past Watford Junction box at 76 m.p.h. This exhilarating burst of speed was quickly cut short by the severe slack through Rickmansworth, but it proved an excellent foretaste of the thrills that were to come when we got north of the Chiltern Hills. Reducing speed carefully to 30 m.p.h. for the sharp curve, we were through Rickmansworth, 17¼ miles in 20½ minutes—a brilliant start indeed.



L.N.E.R. Manchester express near Willesden Green, with "Sandringham" 4-6-0 No. 2841, "Gayton Hall," at its head. Part of the footplate trip described was made on this locomotive. Photograph by E. R. Weathersett.

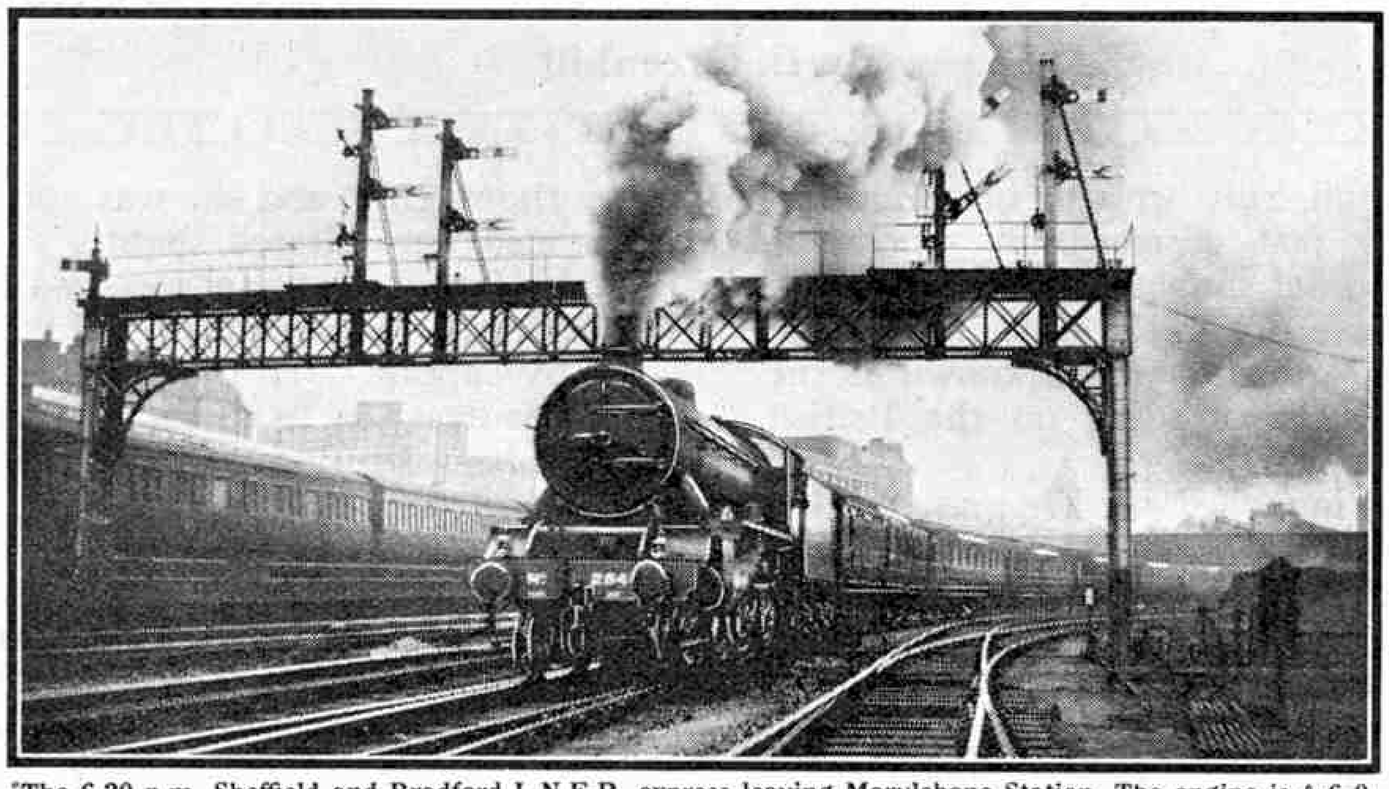
This slack could hardly be situated in a worse place, for right at the platform end begins the 6¼ mile climb at 1 in 105 over the Chilterns. While we were approaching the station with steam shut off, Simpson increased cut-off to 25 per cent. ready, and immediately we were through the platforms the regulator was opened to the full. After about a quarter of a mile he still further opened out, to 30 per cent. cut-off. We recovered speed steadily, passing Chorley Wood at 35 m.p.h. It was a very dark night; the sky was overcast, there was no moon yet, and the overhanging beech woods on both sides of the line made it seem almost like a tunnel, save when an occasional branch or tree trunk was lighted in the glare from the engine. Simpson was constantly looking out, one hand shading his eyes from the light of the fire the better to sight the signals. But now we were nearing Amersham, doing a steady 36 m.p.h., and the heaviest climbing was at an end.

Beyond this point there is a very deep trough in the hills; the line descends steeply to Great Missenden and then climbs again to a summit nearly as high as Amersham, near the hamlet of Dutchlands. Once over the first crest cut-off was brought right back to 15 per cent., but the regulator was left full open and we were soon travelling at an electrifying speed. We flew through Great Missenden at 77 m.p.h., climbed to Dutchlands at the astonishing minimum speed of 63 m.p.h., and then began a breathlessly exciting dash down to Aylesbury. The regulator remained full open until we had reached 80 m.p.h., but then it was almost closed. I have many times been thrilled on the footplate, but have never known the equal of this—tearing downhill on a pitch black night at 85 m.p.h., without a glimmer of light ahead, either from the track or the surrounding country! Approaching Aylesbury steam was shut off, a very slight application of the brake was made to steady the train round the curve, and then with a scream of the whistle we swept through. The 38 miles from Marylebone had been covered in 44 minutes, but despite this magnificent running we were only just on time.

Keeping up a steady 75 m.p.h. over the dead level beyond, speed was then eased to 56 over Quainton Road Junction. This is the end of the Metropolitan and Great Central Joint line; from now onward the route is purely L.N.E.R. From here "*Gayton Hall*" went ahead again in terrific style. On full regulator and 15 per cent. cut-off we were up to 66 m.p.h. at Grendon Junction where the alternative

route via High Wycombe joins in; touching 71 beyond Calvert, we stormed up the 4½-mile bank at 1 in 176 past Finmere without speed falling below 61½ m.p.h., and in the dip that follows were up to 73 in 1¾ miles! So we reached Brackley in 64¾ minutes from Marylebone—2¼ minutes early. This, however, was merely a beginning!

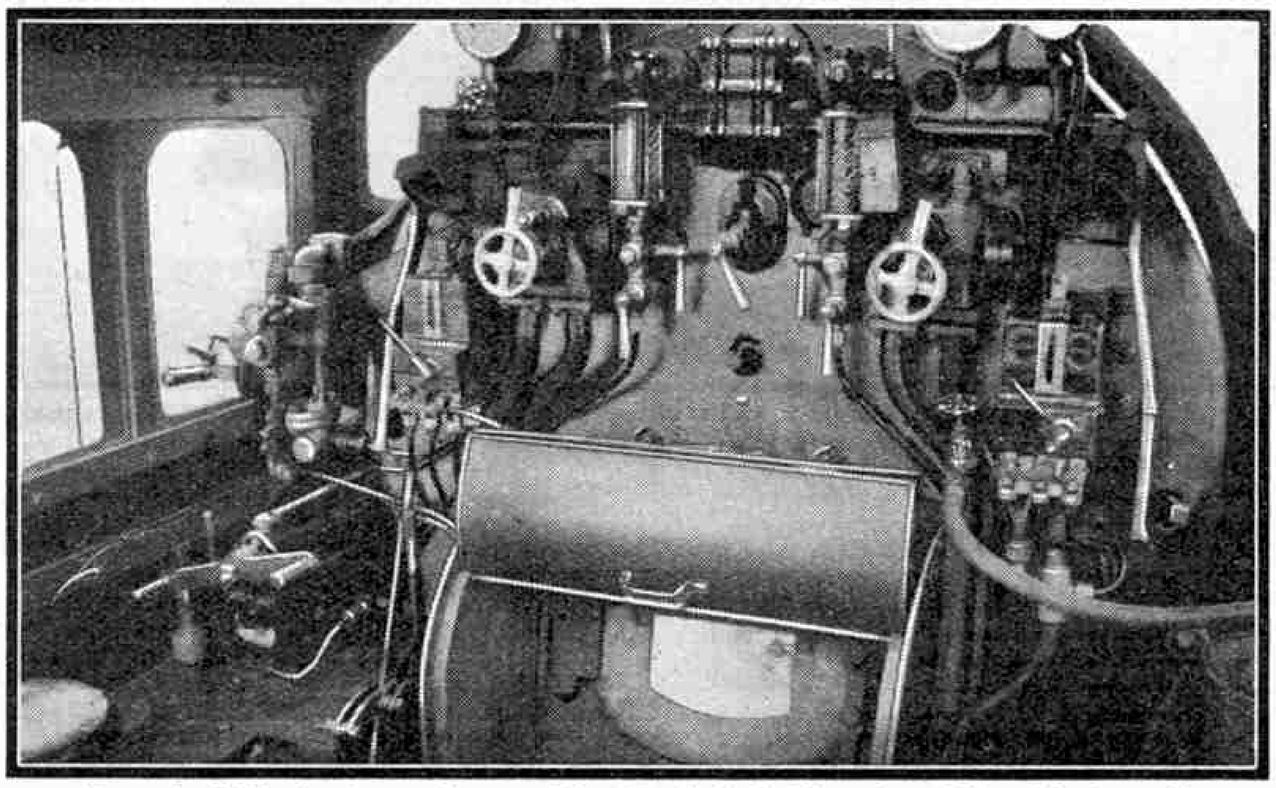
The next 23.9 miles on to Rugby are booked to be covered in 24 minutes start to stop, an astonishing schedule for the distance, especially as the restart has to be made up a 1 in 176 bank. As at Marylebone, the regulator was straightway opened to full; cut-off was quickly brought back to 25 per cent., and the engine tackled the gradient in glorious fashion. At Helmdon summit, only three miles from the start, we were up to 52 m.p.h. and then there followed a perfect orgy of speed. Culworth Junction was passed at 77 m.p.h., we tore through Woodford at 72 and went over the summit at Charwelton at 68; a brief scoop at the water troughs here and then we dived into Catesby tunnel.



The 6.20 p.m. Sheffield and Bradford L.N.E.R. express leaving Marylebone Station. The engine is 4-6-0 No. 2849, "Sheffield United," one of the "Football Club" series.

Once inside, the regulator was practically closed. Throughout the length of this tunnel water is always dripping; the front glasses became spattered as with rain, and a swirling cloud of hot damp steam formed inside the cab. The grade is now 1 in 176 down, but with the regulator almost closed we did not accelerate at all through the tunnel. We emerged into the cold grey light of dawn, and then the regulator was opened to one-half, cut-off remaining at 15 per cent. Now the acceleration became terrific; we went through Braunston at 85 m.p.h. and kept up 78 to 83 m.p.h. right on to the point of slowing down for Rugby. With a careful run in we stopped in 23 minutes 46 seconds from Brackley. What a schedule! In spite of the pace we had come we were just 14 seconds inside booked time.

But the next lap, on to Leicester, was more thrilling even than this; a modest 20 minutes are allowed for this 19.9 mile run! The restart was literally phenomenal. The L.N.E.R. station at Rugby is in the heart of the town, and for two miles the line descends at 1 in 176. Once again 25 per cent. cut-off was used, and at the viaduct over the L.M.S.R. main line, barely a mile from the start, we were doing 51 m.p.h.; a mile further on the speed was 66 m.p.h.—one of the most astounding accelerations from a dead start that I have ever known. Then came the ascent of Lutterworth bank; at first the fall in speed on the 1 in 176 rise was barely perceptible, and at the top of the first stage of the climb we were still doing 58 m.p.h. We were going so splendidly indeed that Simpson took advantage of the dip through Lutterworth station to notch up to 15 per cent. cut-off; here we touched 68 m.p.h., and rushed up the second stage without speed falling below 63 m.p.h.



The cab of "Derby County," one of the "Football Club" series of "Sandringhams."

But the climax was just coming. For the first few miles of the descent towards Leicester regulator and cut-off were untouched, and the resulting acceleration was positively uncanny; but after we had got over 80 m.p.h. the regulator was brought back to about two-fifths open, cut-off remaining 15 per cent. But speed continued to rise rapidly, until we flashed through Whetstone at a full 90 m.p.h. It is often supposed that engines have to be driven well-nigh all-out to attain such speeds as this; far from it with such as the "Sandringhams." "*Gayton Hall*," on 15 per cent. cut-off, was working at just one-fifth full gear, and the regulator was not even half open! Had she been given full regulator, without any increase in cut-off, speed might well have gone over the hundred.

Although the grades flatten out to 1 in 650 beyond Whetstone, we kept up a steady 86 m.p.h. right to the outskirts of Leicester, and completed the 19.9 miles from Rugby in precisely 19 minutes, a gain of one minute on this exceedingly sharp timing. For 12 miles, from Lutterworth to Leicester South Goods Junction, speed averaged 77.3 m.p.h. The complete 103.1 miles from Marylebone to Leicester had taken 112¼ minutes, including one minute standing at Brackley and four minutes at Rugby, a very brilliant performance indeed!

At Leicester "*Gayton Hall*" and her crew were relieved by one of the very latest "Sandringhams," of the series named after football clubs; this was No. 2851, "*Derby County*." These engines differ from the earlier examples of the class in being provided with much larger tenders. The "Sandringham" type was specially designed for the Great Eastern section however, and owing to the small turntables, they were fitted with small tenders the same size as those of the Great Eastern 4-6-0s of the "1500" class. There is also a noticeable difference in the footplate arrangements of these new engines, for the fire-door is provided with a metal surround rather like an old-fashioned hooded fireplace.

Driver Brooks and Fireman Underwood of Leicester shed were in charge. Three vans had been detached from the rear, leaving a load of 200 tons to go forward, and indeed it seemed as though Leicester shed had pitted itself against Neasden, so spirited was the restart. When barely a mile out Brooks had notched up to 20 per cent.; we soared up the 1 in 176 rise past Belgrave, topping the summit at 53 m.p.h., and then cut-off was once again reduced to 15 per cent. The regulator had of course been full open from the moment we got the right-away at Leicester, and remained so all the way to Nottingham.

Once over the crest at Belgrave, "*Derby County*" began to gallop just as freely as "*Gayton Hall*" had done, and we swung through Rothley, only five miles from the start, at 70 m.p.h. As it was June, it was broad daylight now, though in places an early morning mist was rising in the fields. Quorn lake with its background of wooded hills looked very lovely as we swept by, now doing 78 m.p.h. Faster still; Loughborough was passed at 83½ m.p.h., and after crossing the L.M.S.R. Midland Division main line we took the three mile rise at 1 in 176 to Barnston tunnel without going below 65 m.p.h., still on 15 per cent. cut-off. But this thrilling race with time was now practically won. We flew down towards the Trent valley, reaching 81 m.p.h. at Gotham Junction, and kept up a steady 75 to 77 m.p.h. till within sight of Nottingham. Then, drawing up very carefully, we stopped at Arkwright Street station, 22.5 miles from Leicester, in 21¼ minutes, a start to stop average of 63.5 m.p.h. This is the fastest booked lap of the whole run, being allowed only 22 minutes.

For 12 minutes we were unloading, and then a short run of just under a mile brought us into Nottingham Victoria Station; this length was covered in 2¼ minutes, start to stop, an exceedingly smart performance. Here four more vans were detached, leaving only the passenger coach and one van to go forward to Sheffield. This of course was a mere feather-weight for such an engine as "*Derby County*." The route is a very difficult one, infested with curves and junctions, and no less than four speed restrictions were in force. We left Nottingham two minutes late, sustained 50 m.p.h. up the 1 in 130 bank to Kirkby, and did a merry 75 m.p.h. down to Staveley, reaching Sheffield dead on time—5.54 a.m.—having run the 38¼ miles from Nottingham in 45 minutes.

The Story of the "*Waterwitch*"

Last Square-rigger on the British Coast

By B. Greenhill

UNTIL the year 1890 all fruit brought into England was carried in very fast clipper-built schooners, barques and brigs. The vessel shown in the photograph was originally one of these fine little craft. She is the barquentine "*Waterwitch*," now very well known as the last square-rigged sailing ship trading on the British Coast.

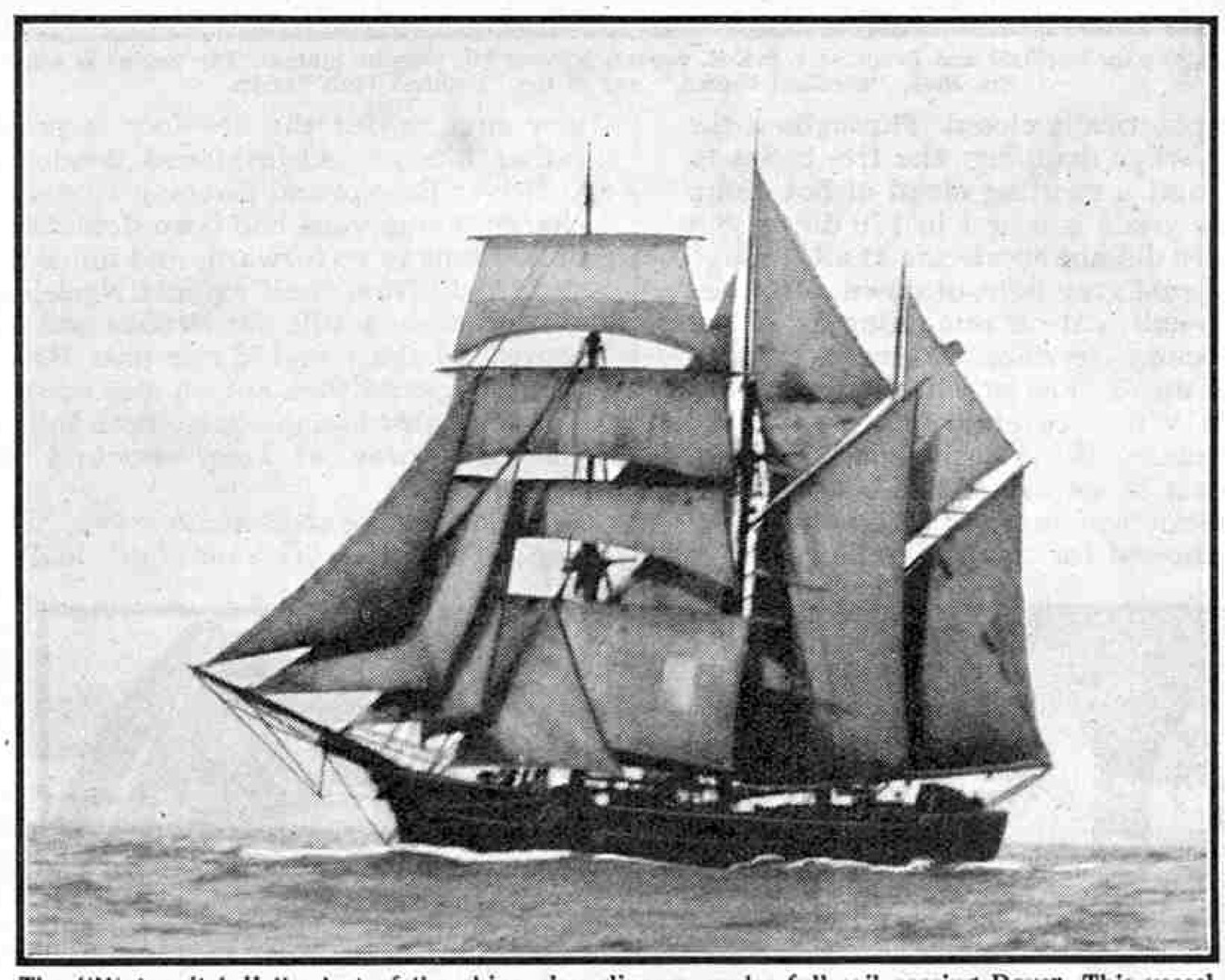
The "*Waterwitch*" was launched by Thomas Meadus and Son, Poole, Dorset, in November, 1871, and although she is over 60 years old, she is still as tight and sound as a new vessel. For the first 15 years of her life she was rigged as a brig and engaged in the West Indies fruit trade. She made some fine passages, which laid the foundations of the great reputation for speed that she has kept throughout her career.

After 1880 the sailing ships began to feel competition from steamers, and, although many of them continued to carry fruit for some time after this, the "*Waterwitch*" herself became a coaster, and she has remained in this trade to the present day. Her only disadvantage as a coaster is that her deep draught sometimes makes it difficult for her to enter small ports. In 1886 she was converted from a brig to a barquentine, a rig that is more economical. Royals and studding sails were fitted, and she retained her reputation as a passage maker, berths in her being much sought after by seamen. At the beginning of this century, she was still registered at her original home port, Portsmouth, and most of her trading was done between Portsmouth and Hartlepool.

In 1911 she was sold to owners at Truro, Cornwall, and began to trade with the west coast ports. She was beginning to show signs of her age at this time, and, although the booms were retained on her foreyard, her studding sails were long out of use. It is said that she was commanded by a skipper with a wooden leg, who had a small hole made in her poop-deck so that he could stand upright in bad weather.

In the early years of the war she was wrecked in the entrance to Newlyn harbour, and remained derelict there until 1918. She was then sold to Mr. Stephens of Par, a member of a family of well-known British sailing ship owners, who had her raised, temporarily repaired and towed to Par. There she was rebuilt. The work was done very thoroughly, and she was not only re-rigged, but her lines also were altered slightly so as to make her more suitable for coasting. Her speed was not impaired, however.

While the "*Waterwitch*" was fitting out she was taken over by Captain C. H. Deacon, who remained in command until his death in 1935. From 1918 until 1930 she traded largely between Cornwall and the east coast ports, with occasional trips to the Continent. After the loss of the barque "*Garthpool*" she and two other barquentines, "*Hilda*" and "*Francis and Jane*," became our only square riggers. Because they carried Cornish china clay, these vessels were known as "the last of the china clay clippers." "*Hilda*" was lost in collision in 1930, and shortly afterwards "*Francis and Jane*" was laid up at Fowey. "*Waterwitch*" thus became our last square-rigged cargo carrier. As a result of this she always carried a number of young men, most of whom had master's certificates in steam and wished to obtain the training in sail necessary for a pilot's licence.



The "Waterwitch," the last of the china clay clippers, under full sail passing Dover. This vessel is the only square-rigger in the British coastal trade.

Since 1932 the "*Waterwitch*" has traded largely on the west coast. She generally carries china clay from the Cornish ports to Runcorn and goes back to Falmouth with gas coke. In 1935, when running with a big cargo from Fowey to Runcorn, she lost a topsail yard when rounding Land's End in a gale, and had to put back to Falmouth.

In 1935 she lost her best skipper by the death of Captain C. H. Deacon. He was a fine seaman, one of the best on our coast, and he knew well how to handle his vessel. He had a great reputation for getting to sea as soon as possible, and not putting in until he reached his destination.

Of late years the "*Waterwitch*" has certainly lived up to her reputation as a clipper. Most of her passages are scarcely longer than those of steamers, while some are much shorter. In 1932 she made a really fine run from Plymouth to Goole in 48 hours, and on another occasion she left Fowey with clay and 32 hours later was in dock at Antwerp. With a good wind on the quarter she can easily pass most coasting steamers.

To-day the old ship is as sound as ever, and in much better condition that she was before the war. Plans have been drawn and models made so that the details of this remarkable vessel will be preserved for future generations.

Wonders of the Cathode Ray Tube

Electron Speeds of 70,000 Miles an Hour

UNDOUBTEDLY November 2nd, 1936, will go down to posterity as a red letter day in the history of radio development, for on that day the British television service was inaugurated by the B.B.C. The present "service area," within which efficient television reception is possible, covers a radius of only approximately 25 to 30 miles around London, but there are indications of a rapid extension in this area in the near future. Already reports have been received of astonishingly good results over 40 miles away.

Before very long there seems little doubt that a serious effort will be made to televise all the more important national events in co-operation with news cinemas, so that audiences will be able to see such great events as the Derby and the Boat Race while they are actually in progress. Even now outdoor transmissions on a large scale are possible. For example, in a recent television programme from Alexandra Palace a cowboy actor rode his horse round an area, going sometimes to a distance of 150 yds. from the television cameras; but during the entire transmission reception was perfectly clear.

The possible cinema development referred to above entails the projection of scenes on to a large screen. This is now being done in two ways. One employs a constant source of light in which the picture comes through a mechanical scanning apparatus; in the other use is made of a cathode ray tube. The latter is a particularly fascinating device, whereby a stream of electrons can be directed in the form of a beam or pencil so as to impinge upon a fluorescent screen. The bombardment of this screen by electrons produces a spot of light that can be controlled and directed across the screen in any direction and at incredibly high speed. In what is known as a 405-line picture this spot of light travels at a speed of no less than 70,000 m.p.h.

The cathode ray tube is employed in the ordinary commercial television receiver, which is now available to the public at prices ranging from £80 to £120. It is due to the enormous speed of movement that the spot of light can be made to trace out a pattern on the fluorescent screen just mentioned. By building up a series of such patterns, which supersede each other at this colossal speed, the eye gains the impression of continuous movement, as it does when it is focussed on the cinema screen.

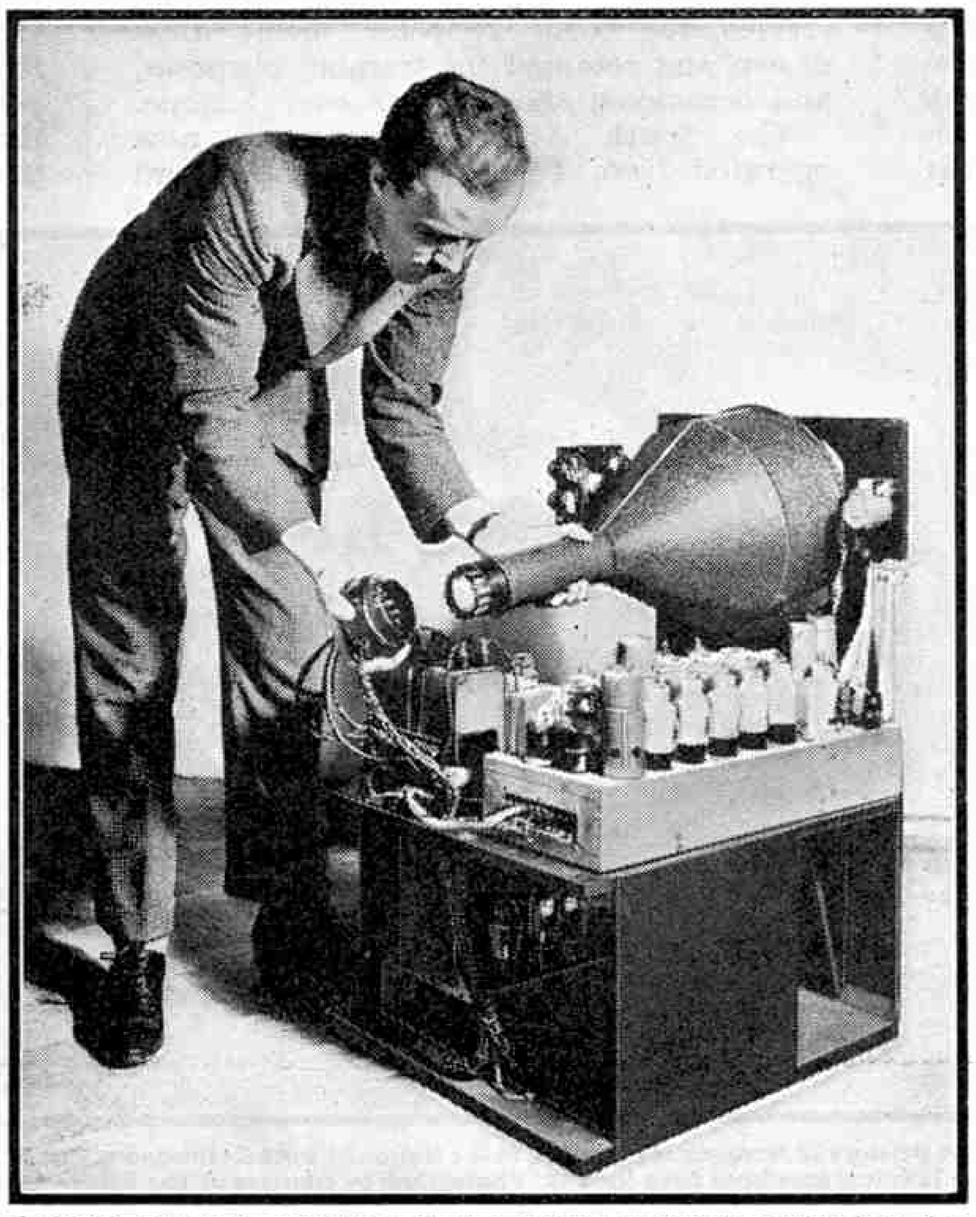
Intensive research work on cathode ray-tubes has been going on in the Wembley Research Laboratories of the General Electric Company Ltd. for some years, and the secrets being discovered now may emerge as the developments of to-morrow.

As an indication of the immense amount of labour and materials involved in the manufacture of television equipment, it is interesting to note that the standard 23-valve G.E.C. receiver contains no less than 3,980 parts, all of which are made by the Company; an alternative set incorporating an efficient 8-valve all-wave receiver for normal broadcast reception carries a further 2,000 parts.

Each of the processes of manufacture is as complex as it is delicate. In the G.E.C. Wembley Research Laboratories, for example, there is a room claimed to be as free from dust as any room can be. It is there that the screens on which the television image is received are constructed. The screen is coated with a powder consisting of zinc sulphide and other chemicals, and when this powder is bombarded by electrons it lights up to project the picture; these electrons bombard the screen at a speed of 70,000 m.p.h. It is because the layer of powder must be absolutely even that the room must not have a speck of dust in it.

It is necessary for an amazingly high degree of vacuum to be provided inside the tube, and its shape has to be mathematically worked out to withstand the strain imposed upon it. Every tube therefore has to undergo a water pressure test of over two tons.

It is only after the screen has been powdered that the cathode is fixed at the thin end of the tube, and from cathode to screen measures 28 ins. An electrode of high positive potential is placed along the tube in order to accelerate the beam of electrons, and a converging electrical field, halfway along the narrower part of the tube, focusses the beam. Where the tube widens are two further pairs of electrodes, which are the vertical and horizontal deflectors. To these deflectors are applied synchronising impulses for locking the picture to the transmission, that is for timing the movement of the spot of light on the fluorescent screen so that the scene at the transmitter is exactly reproduced. In the two systems employed by the B.B.C. frequencies of 10,000 or 6,000 impulses per second are applied to the horizontal deflectors, and 50 or 25 impulses per second to the vertical deflectors. The television receiver can be adjusted immediately by the turn of a switch to accommodate either of these two transmission systems.



A G.E.C. Television Receiver with the cabinet removed, showing how the cathode ray tube is fitted with the aid of a 10-point protected socket. Photograph by courtesy of the General Electric Co. Ltd.

British Air Line Developments

A new air service linking the mainland and the Channel Islands will be inaugurated on 31st May next by Jersey Airways Ltd. It will operate between the Brighton, Hove and Worthing airport at Shoreham and the new airport at Jersey. The flight will take about 1 hr. 20 min., which is considerably less than the time taken by the present service operating by way of Southampton. Jersey Airways is associated with the Southern and the Great Western Railways, and since the company was established in 1933 they have carried 75,000 passengers.

British Airways Ltd., are also planning to improve their services. They have just acquired two triple-engined Junkers Ju.52 aircraft for the operation of their night air mail service to the Continent. This modern type of German air liner has a top speed of 180 m.p.h., and will enable the company to speed up the service, which has been named *"The Viking Night Mail and Freight Express."* The British Airways' subsidised day service to Malmö, via Amsterdam, Hamburg and Copenhagen, is now known as *"The Viking Royal Mail Express."* Both passengers and mails are carried on this line.

Civil Aviation in Russia

The rapid progress made last year in the development of commercial aviation in Russia is to be maintained this year. Plans being carried out will result in the opening of 1,550 miles of new air routes within the country, and it is estimated that during 1937 the Soviet Civil Air Fleet will carry a total of 180,000 passengers and 44,200 tons of mail and freight. The new air routes will be fully equipped with radio beacons and other modern airport equipment. New 10-seater aircraft with a cruising speed of 224 m.p.h. are to be put into service on the Moscow-Irkutsk route, and 12-seater machines cruising at 180 m.p.h. are to be introduced on the Moscow-Simferopol service. Last year the aircraft of the Civil Air Fleet carried 167,000 passengers.

German Airship Progress

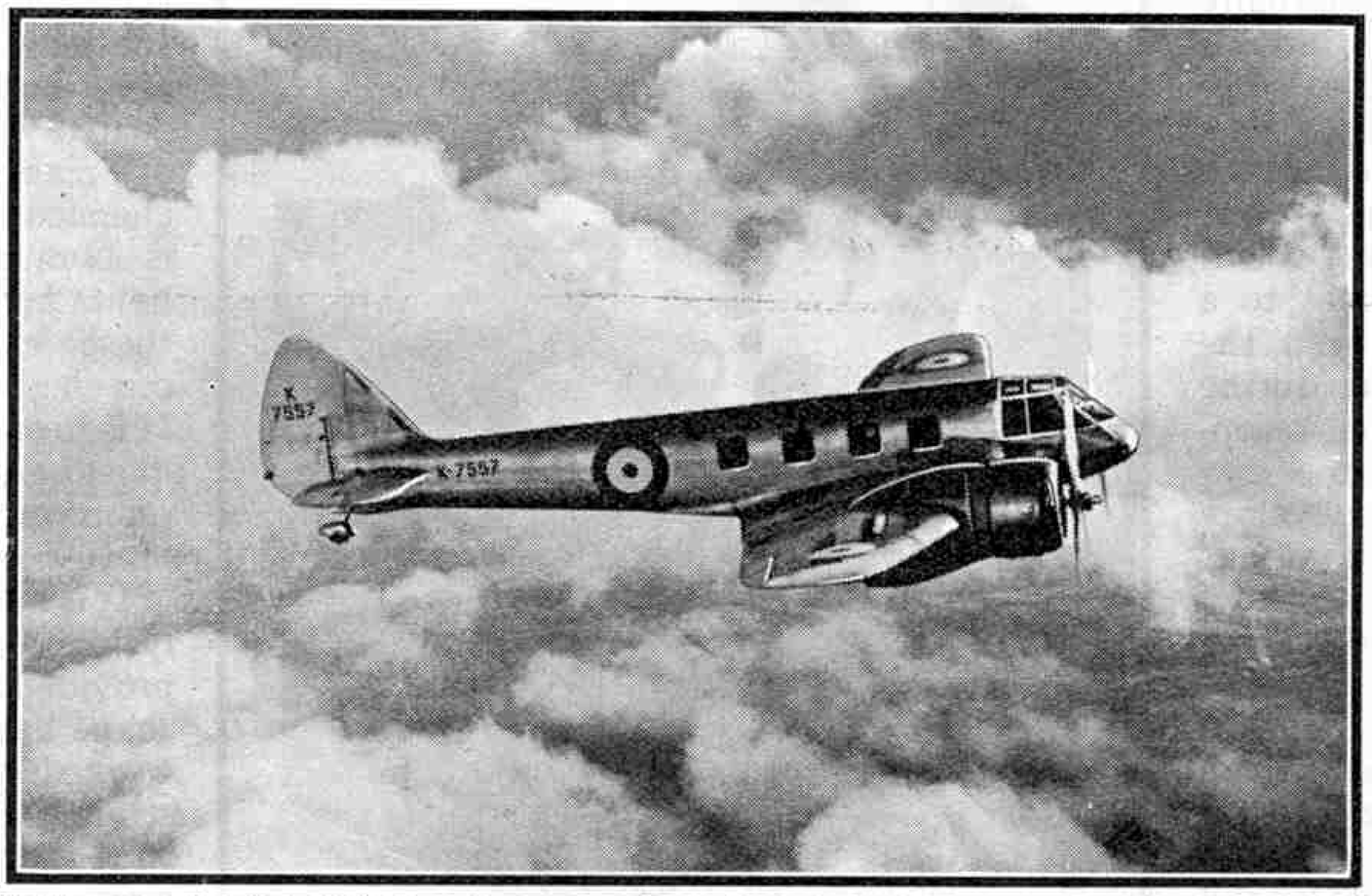
Good progress is being made with the construction of the German airship *"LZ.130"* at Friedrichshafen, and it is expected that it will be ready for service next autumn. It will co-operate with the *"Hindenburg"* on the South Atlantic service, the *"Graf Zeppelin"* being withdrawn and retained for training purposes, and occasional short flights over Europe.

The South Atlantic service is now operated from Frankfurt, and a second large airship shed is to be erected there to house the *"LZ.130."* It is reported that the new shed will be rotatable, so that the delicate task of housing and withdrawing the airship can be carried out irrespective of the direction and strength of the wind. The shed will be floated on a large artificially-made circular pool, 186 ft. in diameter and 6 ft. to 7 ft. deep.

When the *"LZ.130"* is completed and transferred to Frankfurt, the construction of a third airship will be put in hand at Friedrichshafen. This airship will have larger accommodation and provide greater comfort for the passengers than either the *"Hindenburg"* or the *"LZ.130."*

More Aircraft for R.A.F. Squadrons

Most of the R.A.F. squadrons are to have more aircraft than hitherto. The equipment of a heavy bomber squadron is to be increased from 10 to 12 machines, that of a fighter squadron from 12 to 14, and that of a flying boat squadron from four to six.



"Britain First," the Bristol 142 Monoplane presented to the Nation by Lord Rothermere. The Bristol "Blenheim" Bomber (see page 148) was developed from the 142. Photograph by courtesy of The Bristol Aeroplane Co. Ltd

Ottawa Museum Receives Canadian Aeroplane Relics

An aeronautical museum has been established in the National Research Council's building at Ottawa, and the exhibits already include many interesting relics of the early days of aviation in Canada. The most important item acquired is the engine of *"Silver Dart,"* the aeroplane that achieved the first successful flight in the British Empire. This aeroplane was constructed by the late Dr. Alexander Graham Bell, at Baddeck, Nova Scotia, and on 23rd February 1909 flew a distance of ½-mile. The next day it covered the then amazing distance of 4½ miles, at a height of 30 ft., over the Bras d'Or lakes, and on 10th March in the same year it shattered all previous records by flying 20 miles. It was flown by a Canadian aviation pioneer named J. A. D. McCurdy, associated with whom was F. W. Baldwin, another pioneer airman, who was also a member of the Nova Scotia Legislature. The *"Silver Dart"* was wrecked five months later in landing at Petawawa Camp when Baldwin was carrying out a demonstration of its qualities before the military authorities.

Airways in Bolivia

Details received concerning commercial air progress in South America contain interesting particulars of the air services of Bolivia. Regular passenger and mail services are maintained over the loftiest parts of the Andes, and it is claimed that some of the services operate at the highest altitudes, and in the most exacting conditions, of any in the world.

Many of the important airports in that mountainous country are situated at considerable heights. The airport at La Paz is 13,500 ft. above sea level, and that at Orunu, in the rich mining area, is at an altitude of 12,100 ft. The big transport aeroplanes employed often take off at more than 13,000 ft. in a cold climate with the temperature below zero, climb to a height of 20,000 ft., and at the end of their journey land at sea level and in torrid conditions.

The Fokker D.21

The Fokker Company, of Amsterdam, are best known for the many interesting types of military aircraft they have produced. These machines range from single-seater fighters to triple-engined bombing flying boats and seaplanes.

A recent type of Fokker single-seater fighter, the D.21, is shown in the lower illustration on this page. This low wing monoplane follows the usual Fokker construction. The wing is built up of box-spars and plywood ribs, with a bakelite-plywood covering, and the fuselage is a welded tubular steel structure, the upper surface of which is covered with duralumin sheets and the remainder with fabric. Any type of liquid or air-cooled engine ranging from 600 to 1,100 h.p. can be installed, in the nose of the fuselage, and there is a large fuel tank immediately behind the engine and a smaller one in the wing, under the fuselage.

A machine gun of 0.5 in. calibre can be fitted, to fire through the airscrew field, and two guns of 0.3 in. calibre in the wings. Alternatively two 20 mm. cannons can be fitted in the wing, and two 0.3 in. machine guns in the fuselage. The trigger levers for operating the machine guns and cannons are situated in the enclosed cockpit and conveniently near to the pilot. The performance of the machine depends upon the type of engine fitted. When equipped with a Bristol "Mercury VII," and a fixed undercarriage, the D.21 has a top speed of 274 m.p.h., and when fitted with a Hispano-Suiza 12Ycrs engine and a retractable undercarriage the machine has a top speed of 295 m.p.h.

Major C. J. Galpin, D.S.O., Assistant Director General of Civil Aviation, presenting the trophies won at Hamley's First Annual Model Aeroplane Construction Competition. Photograph reproduced by courtesy of Hamley Brothers Ltd., London, W.1.

Proposed Australian Air Service

The Australian Defence Department have invited tenders for the operation of an air service between Sydney and New Guinea. The contract would cover a period of five years, and one of the conditions is that multi-engined air liners must be employed. The aircraft will have to be capable of cruising at 140 m.p.h. when carrying six passengers and freight, and must be capable of a range of at least 500 miles against a 30 m.p.h. wind. The proposed service will be a weekly one, and mail will be carried in addition to passengers and freight.

Aerial Detection of Forest Fires

It is reported from Canada that during the five months April to September last year, aircraft on patrol duty in Ontario succeeded in detecting over 2,000 forest fires, and by giving timely warning were instrumental in saving vast areas of forest.

R.A.F. Vacancies for Apprentice Clerks

The Air Ministry announces that further vacancies will shortly occur for well educated boys to enter the R.A.F. as apprentice clerks. This is a career that may appeal to many boys who, while they may have no inclination towards a mechanical trade, are attracted to Service life and wish to travel abroad. Entries will be made in April and July of this year, and candidates must possess an approved School Certificate and be between the ages of 15½ and 17¼ years on the first day of the month of entry.

Successful candidates undergo a thorough course of training in clerical duties during their first 18 months' service. During that time special attention is given to their general education and to physical training, and full opportunities are provided to take part in games and exercise in the open air and in social activities of their unit. The work on which Service clerks are employed in offices at Headquarters of commands and other formations at home and abroad is varied, and covers administrative work in the case of clerks (General Duties), and accounting for pay and equipment in the case of other clerks.

It should be mentioned that all apprentice clerks have an opportunity to volunteer for training as airmen pilots, and those ultimately selected for flying duty are employed for at least six years on such duty before returning to clerical employment. Apprentice clerks are attested for 12 years regular Air Force service from the age of 18. At the age of 30 they return to civil life, but will normally be given an opportunity of entering the R.A.F. Reserve and of drawing a gratuity of £100. A limited number may be permitted to re-engage to complete 24 years' service, thus qualifying for pension.

Full information concerning rates of pay, promotion, etc., is given in Air Ministry Pamphlet 9, a copy of which can be obtained on application from the Inspector of Recruiting, Royal Air Force, Victory House, Kingsway, London, W.C.2.

Broadside view of the Fokker D.21 single-seater fighter. The armament of this Dutch aeroplane can be varied considerably, and may include up to four machine guns, all installed in the wing, or two there and two in the fuselage. Photograph by courtesy of N.V. Nederlandsche Vliegtuigenfabriek, Amsterdam.

Radio Approach Beacons at Croydon

Experiments are being carried out at Croydon Airport with the Lorenz, Marconi and Plessey systems of ultra short wave radio approach beacons. The experiments are part of an Air Ministry investigation into means of providing additional radio help to aircraft approaching an airport when visibility is very poor. All the systems are designed to facilitate safe landings during bad visibility by providing automatic navigational assistance to approaching aircraft, except when conditions are so bad that the surface of the airport cannot be seen at a height of 50 ft., a very rare occurrence. The systems are intended to supplement the ordinary direction-finding ground equipment, which is used only to guide aircraft to the immediate neighbourhood of an airport.

The chief features of the installation are a main beacon that operates on a wavelength of 9 metres and provides a path of approach from a distance of 10 or 15 miles; a "distant" beacon, working on a wavelength of 7.89 metres and placed 1½ to 2 miles from the airport, that throws up a vertical radio screen across the main approach path; and an "inner" beacon, also of 7.89 metres, that performs a similar function on the approach path at a point about 300 yds. from the boundaries of the airport.

The Lorenz beacon has been installed at the south-east corner of Croydon Airport, and gives an approach path from the north-west corner. The Marconi beacon, erected at the north-west corner, gives an approach from the south-east corner toward the north-west; and the Plessey beacon, installed at the south-west corner, gives an approach from the north-east corner of the airport. The experiments will provide useful data for the further improvement of the systems.

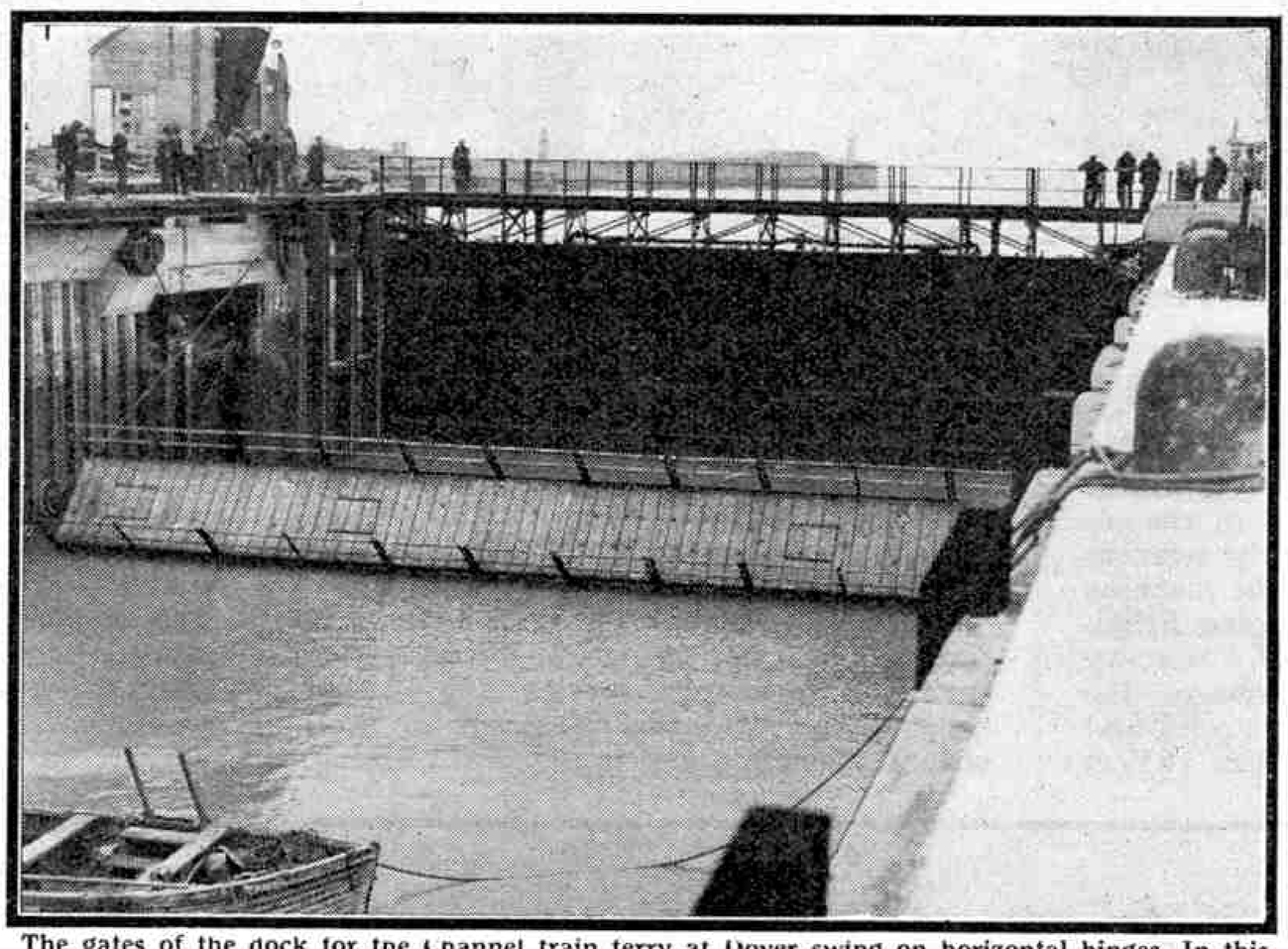
The Dover—Dunkerque Train Ferry

A Triumph of Constructional Engineering

By a Railway Engineer

OCTOBER 14th, 1936, marked the beginning of a new era in the history of transportation between England and France. On that evening the first London-Paris through expresses steamed out of Victoria on this side of the Channel, and the Gare du Nord in Paris. The inauguration of this service by means of the Dover-Dunkerque train ferry was made possible only after engineering obstacles of an unprecedented character had been overcome. High seas, and totally unexpected geological formations in the sea bed, greatly hindered the construction of the dock at Dover; indeed, the Channel itself, the terror of passengers since the earliest times of travel to the Continent, proved an even greater terror to the constructing engineers.

Before describing the construction of the new train ferry, however, it is interesting to recall some of the schemes that have been put forward from time to time for making the Channel passage more comfortable. To those unacquainted with Dover and Folkestone it may seem a little strange that so narrow a waterway, and one so apparently landlocked, should be subject to such storms. I shall never forget an October day at Dover when a tearing west wind was sweeping up the Channel; huge waves striking the Admiralty pier were being shot up vertically fifty feet into the air. Once the water rose above the top of the breakwater it was caught by the tremendous wind and flung away level to land with a crash on the roof of the Marine station. Not so many years ago the Continental Boat Expresses were unloaded on the Admiralty pier itself, and on such a day changing from train to boat would have been unspeakable. The Marine station certainly made transhipment much more comfortable, and the Train Ferry service, by taking the whole train on board ship, avoids any changing at all.



The gates of the dock for the Channel train ferry at Dover swing on horizontal hinges. In this illustration the inner gate is being lowered to open the dock and is seen almost completely submerged.

The notorious roughness of Channel weather has in the past called forth many proposals, all designed to lessen its ill effects on passengers; some of these were quite openly freakish, while many ingenious propositions proved impracticable in service. Most famous of all schemes, and one that captured popular fancy by its very boldness, was the Channel Tunnel. But for the outbreak of the Great War in 1914 a start might actually have been made with this most ambitious project. A company had been formed and trial borings made on the Kent coast near the western end of Shakespeare's Cliff tunnel, but whether the undertaking would ever have been completed is a moot point.

The Channel Tunnel idea dates almost from the earliest days of railways. It was ridiculed in many quarters and, as a counterblast, its critics brought forth some alternative schemes which for originality leave the tunnel idea well in the shade. One suggestion was to carry a line of railway across the Channel suspended from a row of captive balloons; another involved the construction of a floating bridge, 22 miles long incidentally, which, being articulated throughout, would adapt itself to the rise and fall of the waves. These schemes must not be taken too seriously. They were probably the creations of some nineteenth century counterpart of Mr. W. Heath Robinson, but contemporary engineering was full of ideas just as fantastic as these, of which there is ample evidence in the records of the Patent Office.

In an attempt to give a smooth passage in all weathers, two of the strangest ships that have ever sailed the seas were put into service in mid-Victorian times. They were named *"Castilia"* and *"Calais-Douvres."* These curious-looking vessels were in effect double-boats—two ordinary ships placed abeam and joined together by an extremely wide superstructure. They had two-pointed bows and sterns, and were driven by a single paddle wheel placed in the very centre of the ship. They were unsuccessful however, and gave place to the more conventional types of cross-Channel boats.

Train ferries are in use in many parts of the world; indeed there have been two services operated across the English Channel for some time. Of these the Harwich-Zeebrugge ferry is purely a freight service, while that from Richborough, near Sandwich, was a war-time expedient by which English rolling-stock, stores, and munitions were ferried to either Calais or Dunkerque. But in one respect the new Dover-Dunkerque service is unique; it is the only passenger train ferry to cross the open sea. It is this very feature that caused, indirectly, such exceptional difficulties in construction.

At train ferry ports, where the ships are berthed in a tidal basin, it is usual to construct a hinged bridge to connect the ferry with the shore. This bridge is made sufficiently long to accommodate both extremes of tide without giving too steep a slope up or down to the ship. At Dunkerque the train ferry berth is situated inside the dock area and is therefore unaffected by tides; but at Dover there is no less than 25 ft. difference between high and low water. Such a variation would require a sloping bridge of quite impracticable length, and it was therefore decided to build a totally enclosed dock inside Dover Harbour, adjacent to the Marine station. By so doing the water level in the dock could be raised or lowered at will, and the train deck of the ferry brought level with the railway tracks on the quayside at any state of the tide.

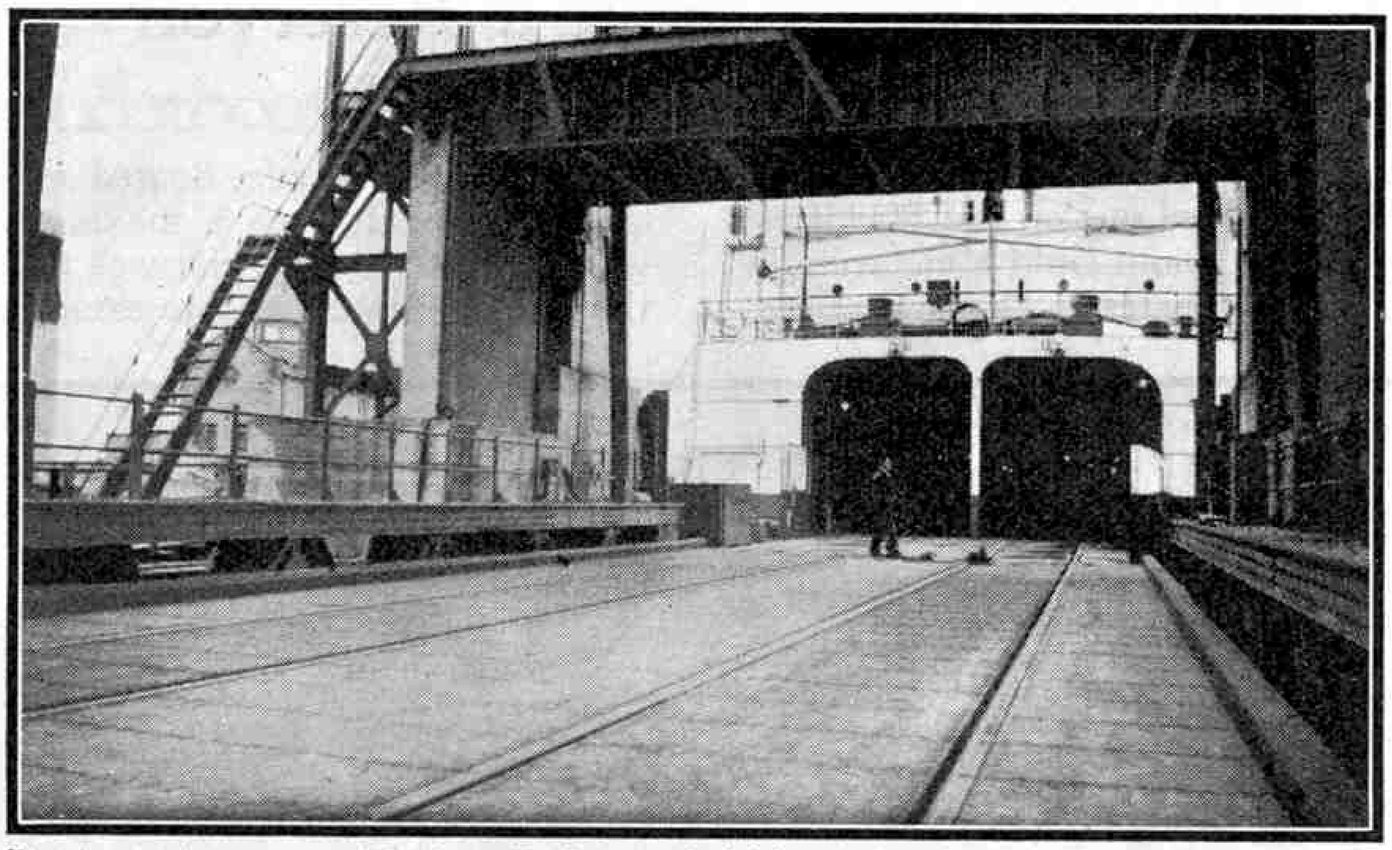
In view of such extremes of water it may at first sight appear strange that Dover was selected as the port on this side of the Channel. Actually there was no other choice. Newhaven would have involved too long a crossing; at Folkestone the harbour is little more than a single breakwater, and as at Dover there is no natural haven at all. Then Richborough, while well situated from the shipping point of view, would have made a very inconvenient place of embarkation for passengers, especially for those who travel to the Continent in their own cars and cross by the train ferry. It is indeed a singular geographical fact that the south-east corner of England has not one natural harbour of any size between the Medway and Portsmouth.

The first scheme for a train ferry dock at Dover involved the construction of a surrounding cofferdam. This was designed to consist of steel sheet pile walls driven into the chalk, and stiffened with various cross walls. Work began, and a certain length of the pile walls had been driven. But the Dover breakwaters, and even the vast length of the Admiralty pier, can give little shelter from a full-blooded Channel gale, and in the first of the winter storms the whole of the work was demolished. It was then clear that an infinitely more massive structure was needed, and a new design was prepared incorporating concrete walls 25 ft. thick. Then walls were built on concrete foundations made up of a number of 7-ton pre-cast blocks, shaped so as to interlock with one another like the pieces of a jig-saw puzzle, and able to resist the greatest storm imaginable. These blocks were laid under water by divers.

The dock walls were, of course, built on three sides only, an opening being left on the seaward side that eventually would become the

dock entrance for the ferry boats. A temporary steel caisson weighing 525 tons was then constructed to block the entrance, the proposal being to sink this caisson into position and then pump out all the water from the enclosed area so that the dock walls and floor could be completed in the "dry." It was now that troubles worse than any Channel storm were first encountered.

The caisson was duly sunk into position and pumping began, but no change in the water level took place. Investigation revealed a number of large fissures in the hard chalk forming the sea bed, and as fast as water was pumped out the increased pressure of the sea outside forced more water up through the bottom of the enclosed dock area and no progress whatever could be made. An attempt was made to seal these fissures by depositing a quantity of mud on the outside of the dock walls; it was hoped that this mud might be sucked down in the crevices below, but after several weeks of work the experiment proved to be of no avail. In certain similar cases on the Continent the difficulties had been overcome by the novel method of freezing a certain thickness of the sea bed, and at Dover it was next proposed to form a solid barrier of ice and chalk all round the dock area. Eventually this proposal was abandoned without being tried out, and a unique method used that ultimately proved successful.



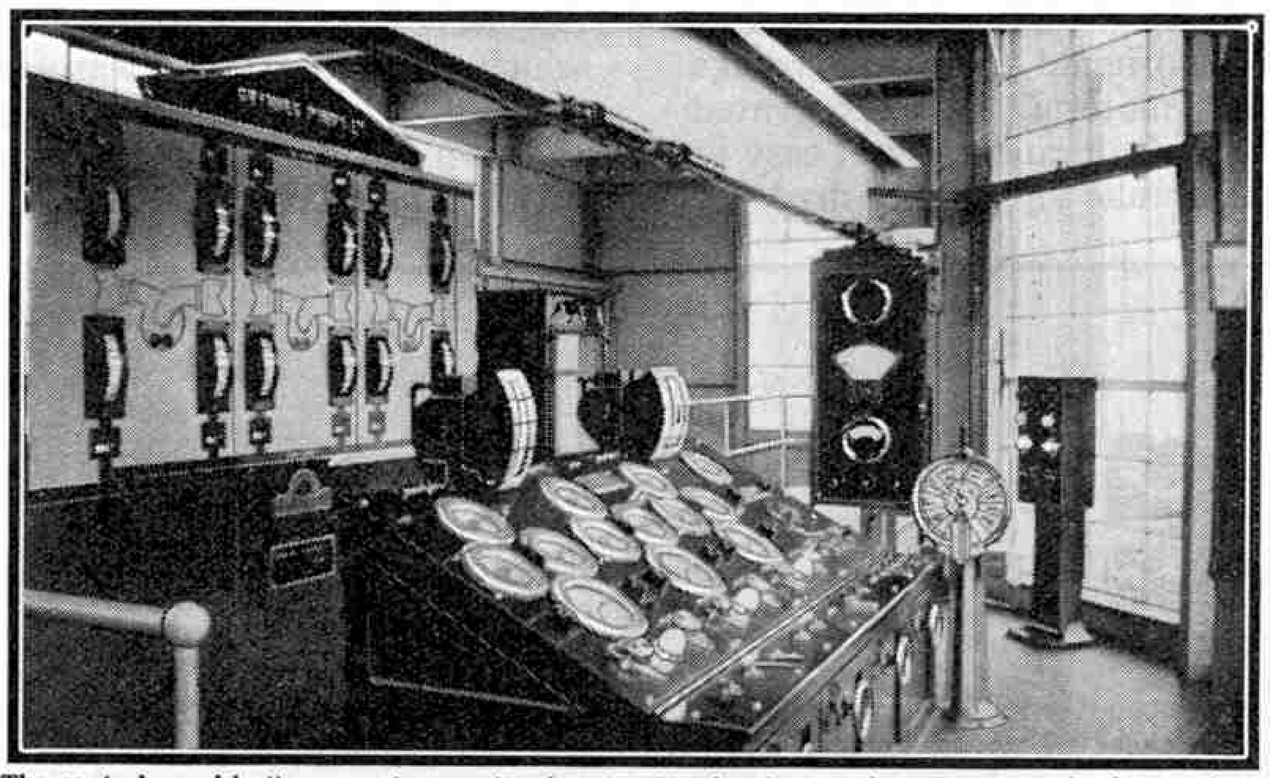
The hinged bridge approach to the ferry. The figure on the left is at the junction of the bridge and the train deck.

The task as now fully revealed was a truly formidable one. The completion, under water, of the dock walls and floor was not an unduly difficult undertaking, but the construction of the entrance cill, the bearings and foundations for the gates, and the necessary chamber for the pumping gear, was a very different matter. Furthermore the work had to be done in a place where the conditions in times of storm are just like those of the open sea, and where huge waves of 15 to 20 ft. may sweep over the whole dock. A dredger was brought into the dock area and, by closing the entrance by means of the temporary caisson, the excavation of the dock floor down to the required depth could be done in still water. This was a great help, but further trouble was experienced owing to the extreme hardness of the chalk. The ordinary dredger buckets would not cut it at all, and special hardened steel teeth had to be provided before any impression could be made.

The entrance gates are of unusual design. Instead of having vertical hinges and opening like a pair of doors, they are hinged horizontally, and at right angles to the length of the dock. Thus, when opened for the passage of a ferry boat, they swing downward until, becoming totally submerged, they lie flat on the dock floor. The seaward gate swings outward away from the shore, and the inner one moves in the opposite direction. Each gate when closed completely fills the entrance gap between the two dock walls, and the construction and installing of the surrounding framework that carries the gate hinges was one of the most critical parts of the whole job. This frame took the form of a steel pontoon shaped like a squared U; it was built completely, then towed into the dock entrance, and lowered into position between very accurately constructed guides. Some idea of the magnitude of the task can be gathered from the weight of this pontoon; before the frame was filled with concrete the steelwork alone weighed 440 tons, that is just about the weight of the *"Golden Arrow"* boat express! Yet although the dock walls and guides were constructed entirely under water, and the steelwork of the pontoon built up on shore, when lowered into place the pontoon was found to be correctly positioned to within one-tenth of an inch—an astonishing feat that involved precision methods more like those used in instrument-making than in civil engineering works of such magnitude as this.

The construction of the pump house was another very difficult and entirely novel undertaking. To raise or lower the water level inside the dock as quickly as possible, three sets of centrifugal pumps are used, each of 230 h.p.; when working together these three sets of pumps can deal with 120,000 gallons of water per minute. In order to obtain the greatest efficiency it was necessary for the pumps to be located well below the level of the lowest tide, and a depth of 50 ft. below high water mark was decided upon. This entailed the building of a chamber 100 ft. long by 40 ft. wide below the level of the sea. At high tide, when the water level in the enclosed dock would be some 10 or 12 ft. below that of the sea outside, the floor of this chamber would be subjected to very great pressure from underneath due to water attempting to flow up through the fissures in the sea bed and equalise the water levels. Accordingly the floor had to be made immensely strong to withstand such pressure.

An elaborate foundation was prepared on the sea bed, consisting of a large quantity of old rails arranged in grillage form, and on to this foundation were placed 21 large girders 48 ft. long and 5 ft. deep, and pitched at no more than 5 ft. apart. The spaces between these girders were then filled with concrete, and in view of the submarine conditions a special form of under-water bucket, or "skip" was used. The skips were lowered to the required depth, guided into position by the divers, and then opened to discharge the concrete into its correct position. In this way a very thick concrete floor was built on the sea bed, formidably reinforced by the 21 girders. The walls of the pump house were built in concrete by means of what are known as "Tremie" pipes; these allow the concrete to be passed down into the water without being washed away, and brought right to the point where it is required. When the walls were completed the water was all pumped out, and although the construction had been carried out entirely beneath the sea, the chamber proved perfectly watertight.



The control panel in the pump house, showing the electric telegraph installed to receive instructions for raising or lowering the level of water in the dock.

So for three years the work went on, day and night, and, so far as could be seen from above, with little or no progress. But by the summer of 1936 these most difficult tasks were completed and the superstructure on the dock side rapidly built. The three pumps are located in the very lowest part of the pump house, and they are driven through long vertical shafts by electric motors situated at quayside level. This upper floor of the pump house is an open steel grid through which one can see right down to the pumps below. Descending to the pumps themselves by means of steel ladders is rather like going down into the engine-room of a ship; there is no doubt about the point where you pass below sea-level. A curious chill comes over the atmosphere inside, despite the excellence of the walls. The control platform, with its many recording dials, commands a good look-out over the dock, and an electric telegraph is provided for receiving orders regarding the raising and lowering of the water in the dock.

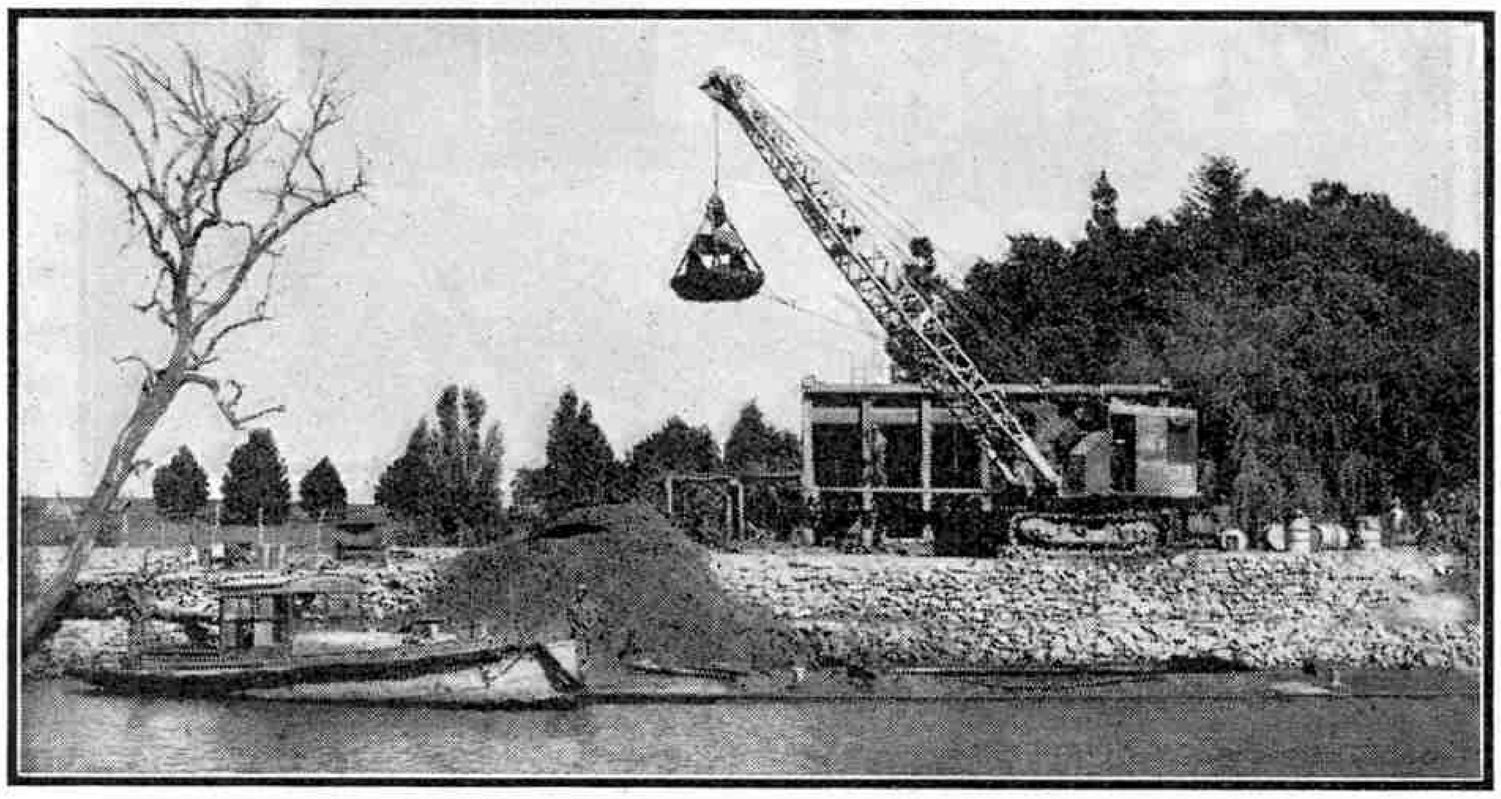
Next month I shall describe a through trip from London to Paris.

Dredging on The Rand

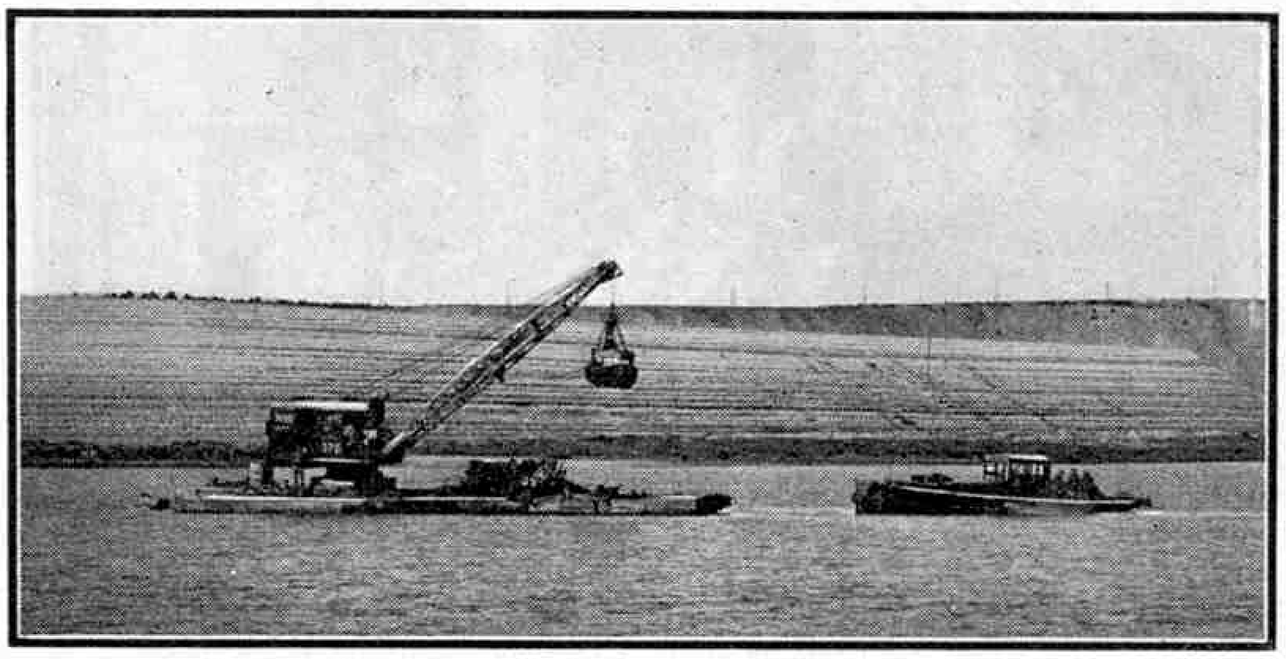
Silt Excavated from a Reservoir

THE illustrations on this page show dredging operations of unusual interest being carried out on the Booysens Spruit dam and reservoir in the Rand Gold Mine area of South Africa. This dam supplies water to the gold mines controlled by Rand Mines Ltd., and originally was 30 to 35 ft. deep, with a water conservation area of 100 acres. It stands in the midst of an area covered by waste dumps from the mines, and with the passing of years slimes and other deposits from the dumps had been blown by strong winds and washed down by heavy rains into the reservoir. The result was that its capacity had decreased and its greatest depth had become only 14 ft.

A plentiful supply of clean water is very important in gold mining, and the owners of the reservoir set to work to devise some scheme for removing the silt rapidly, and at low cost, in order to restore the original depth and storage capacity of the reservoir. The material to be excavated consisted of heavy black clay and silt, and was not easy to handle. The use of various hydraulic and dipper dredging plants was considered, and finally it was decided to remove the silt by means of Ruston-Bucyrus clamshell excavators. In these excavators the two sections of a bucket close over the material to be removed like the double shell of a clam, and open again to release it after being raised and swung round to the place where it is to be discharged.



Deepening a reservoir on the Rand. A Diesel clamshell excavator, mounted on caterpillars, removing the silt from a barge. The illustrations to this article are reproduced by courtesy of Ruston-Bucyrus Ltd., Lincoln.



A Ruston-Bucyrus clamshell dredge loading silt from the reservoir into barges.

Two clamshell excavators actually were used. One of these was a Diesel dredge, fitted with a boom 35 ft. in length and a bucket with a capacity of 1½ cu. yd.; and the other was a Diesel excavator mounted on caterpillars, with a 50-ft. boom and a bucket holding 1¼ cu. yd. The equipment also included a Diesel tug of 64 b.h.p. and three 80-ton hopper barges, each with a capacity of 60 cu. yd., all of which were made by J. S. Watson (Gainsborough) Ltd., of Gainsborough, England.

The clamshell dredge floated on the water, and its bucket dug out the silt from a maximum depth of 35 ft. below water level. The material was raised and discharged into the hopper barges, and as each of these was filled it was towed by the Diesel tug alongside the dam wall, on top of which the caterpillar-mounted clamshell was at first placed. This excavator emptied the barges and dumped the silt over the wall, where a limited area was available for this purpose. When this area was filled, the clamshell moved from the wall to the foreshore, where it discharged the silt through a hopper bin into tip wagons of 1 cu. yd. capacity, which took the spoil away to the adjoining flats to be dumped.

Dredging began in December 1934, and two shifts per day were worked during the following six months, after which one shift per day was worked. During this period of nearly 13 months, 245,740 cu. yd. of silt were removed from the reservoir, the water capacity of which was increased by 41,775,800 gallons. The intention is to continue dredging until approximately 1,000,000 cu. yd. of silt have been removed. The reservoir then will have a capacity of about 193,000,000 gallons.

A striking feature of this interesting work was its low cost. During the period mentioned, the actual cost of removing the silt was only 4.80d. per cu. yd., and only 2s. 4d. was spent for each 1,000 gallons gain in capacity. This figure includes the operating and maintenance costs of the clamshell dredge, the caterpillar clamshell, the Diesel tug, the three hopper barges and other equipment used, together with the salaries and wages of operators and crews.

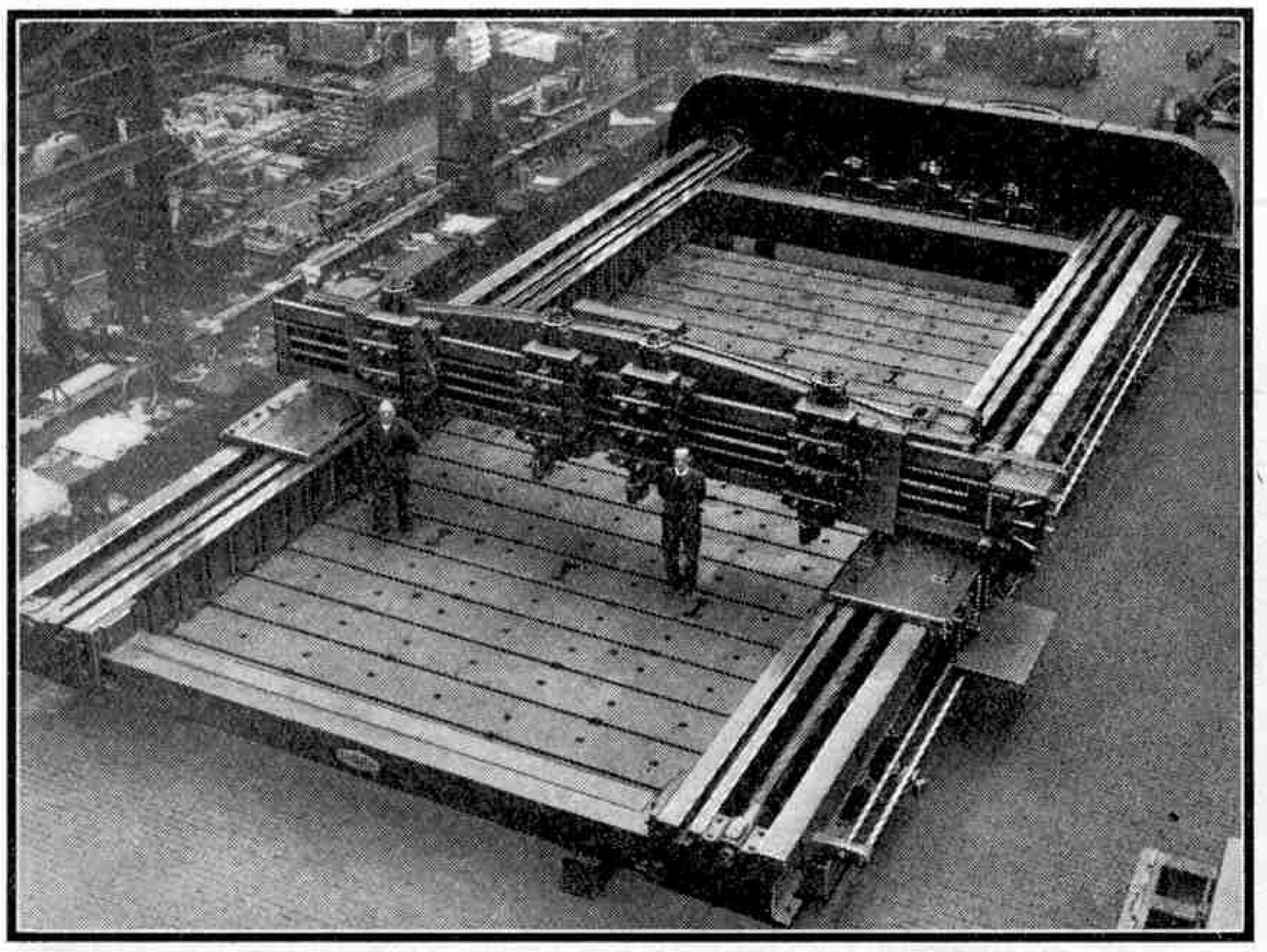
Wages and other expenses are much higher in South Africa than in Great Britain, and the low cost of the work is evidence of the care and skill with which the operations were planned by the engineers responsible.

Shaping Armour Plate for Battleships

A Giant Planing Machine

MANY of the largest machine tools that have yet been made are used in connection with shipbuilding, for shaping the steel plates and girders that go to the making of a vessel's hull. Generally the larger the vessel, the larger are the individual plates and girders required, for to ensure watertightness and strength it is advisable to have as few joints as possible in the structure. The making of a giant liner or warship therefore necessitates the employment of massive machines, and a typical example is illustrated on this page. The machine shown is a pit type planer built recently by Craven Bros. (Manchester) Ltd. for a British firm, and was designed specially for planing the surfaces and edges of the great steel plates used for the armour plating of warships. It has an overall length of 65 ft. 6 in. Without electrical equipment it weighs 210 tons, and it will plane plates up to 40 ft. long and 18 ft. wide.

The planing machine is really a development of the lathe, and is second only in importance to it. The purpose of the lathe is to turn cylindrical surfaces true from end to end, and that of the planing machine is to produce true flat surfaces.



A giant planing machine specially designed for planing armour plates for warships. It is 65 ft. 6 in. in length and was built by Craven Bros. (Manchester) Ltd., to whom we are indebted for our illustration.

The action of a planing machine resembles the successive cuts of the tool used on a lathe. In a planing machine of the usual type, the tool is carried on a traversing slide and the work is attached to a moving table, which slides backward and forward along the bed of the machine. In this manner the work is forced against the tool.

Planing machines used in modern workshops often differ considerably from each other in design but the principle on which they work is much the same in each case. The giant machine shown on this page possesses several features that distinguish it from the usual type of planer. Instead of the work being mounted on a sliding table, it is fixed to a stationary base, and the tools are carried on a sliding crosspiece that travels backward and forward and forces them against the work.

The main base of the machine is built in four sections, each of which is 10 ft. 6 in. wide, and to this the plate to be planed is fixed. The machine proper consists of two slide beds, which are suitably braced together by cross girders, and are supported on the outer ends of the main baseplates. The slides are provided with accurately machined surfaces on which travel uprights that in turn carry a cross slide on which the cutting-tools are mounted. Each of the slide beds is provided with a massive screw that runs from end to end of the machine, and passes through a large nut of great length, which is fixed to the underneath of each upright. The screws are driven by an electric motor; as they rotate the uprights and the cross slide travel from end to end of the machine as required.

The motor that operates these screws is situated at the rear end of the machine, as seen in the illustration on this page, and is fitted with special variable speed control gear. It has an output of 60 h.p. at 325 r.p.m., rising to 120 h.p. at 975 r.p.m., and drives the traverse screws through reduction gearing totally enclosed in sheet steel casings.

The drive is so arranged that each screw is driven at the same rate and with the same amount of power. When the cross slide reaches the limit of its travel at each end of the machine, it operates adjustable tappet gear which automatically reverses the direction of rotation of the driving screws. The slide with the tool holders then travels back in the opposite direction. Hand reversing is provided on the right-hand side carriage for the convenience of the operator when travelling up and down the machine with the cross slide.

Each of the tool-boxes is provided with transverse and down automatic feed, which is supplied from ratchet-operated mechanism, and the outer tool boxes are arranged to swivel so that the edge of the plate may be chamfered or tapered as required. Quick power traverse to the transverse motion of the tool slides is operated by a 10 h.p. motor mounted upon the right-hand upright.

When setting up the machine to commence work it is possible to operate the tool-boxes by hand motion, special gear for this purpose being provided at either side of the machine, and the boxes are so arranged that any of them may be disconnected from the feed-mechanism should all four boxes not be required in operation at one time.

Special attention has been paid to the proper lubrication of all working parts of the machine. Wherever possible a pump system of lubrication is employed, but where this is not practicable oiling nipples are fitted for use with an oil gun.

A Lightning Run on the Southern

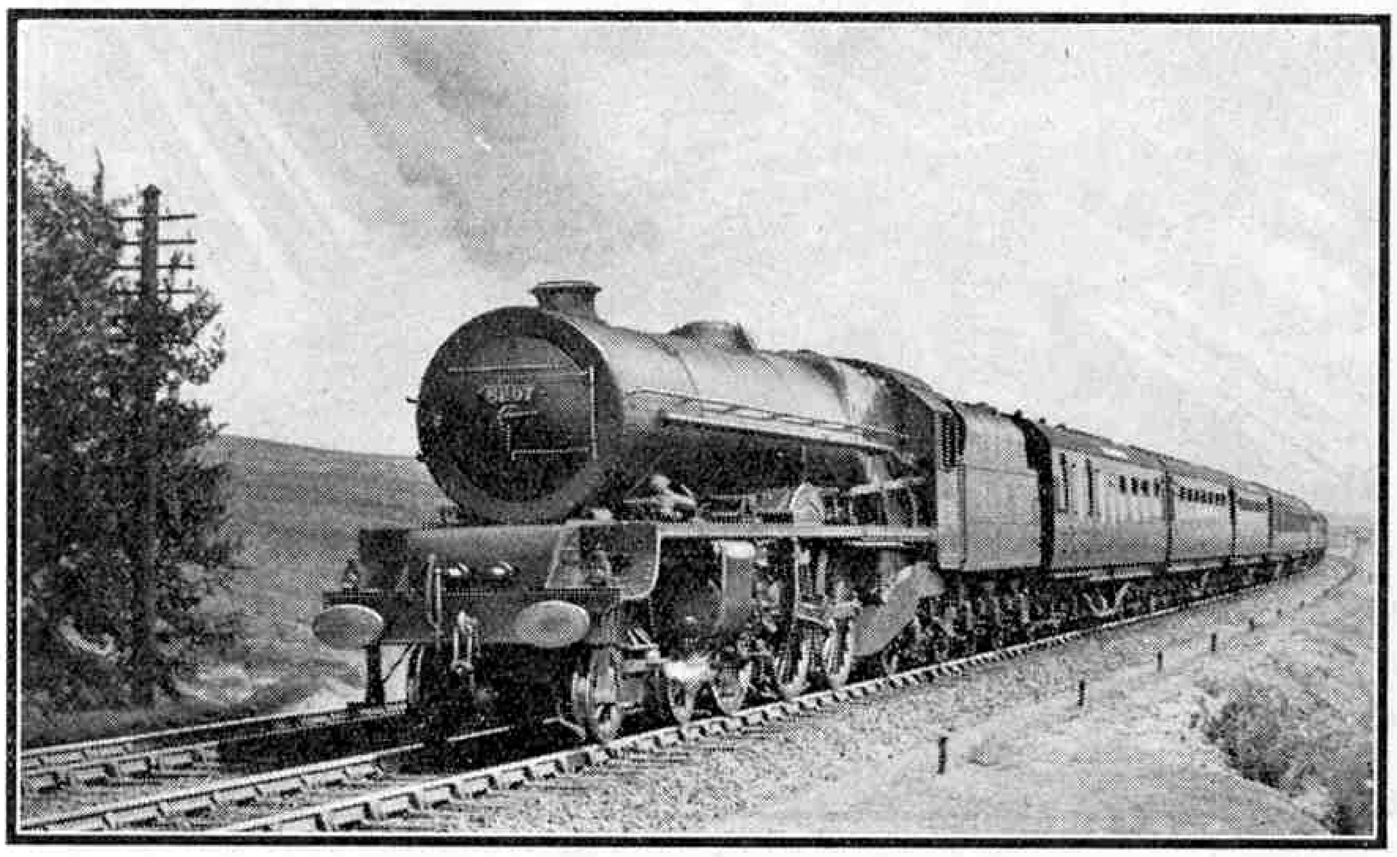
Although most of the "Lord Nelson" class 4–6–0s are employed on the Continental Boat expresses between London and Dover, one of them usually works the "*Atlantic Coast Express*" between Waterloo and Salisbury. On this latter train No. 856, "*Lord St. Vincent*," recently made a most brilliant run. The load was a heavy one of 13 coaches, 420 tons empty and 450 tons with passengers and luggage, but in spite of this 6½ minutes were gained on schedule time, and the 83¾ mile run was completed at a net average speed of 60½ m.p.h. start to stop.

The start was three minutes late, on account of heavy traffic at Waterloo, and two minutes further were lost by adverse signals between there and Clapham Junction. The remaining 80 miles on to Salisbury were reeled off in 76½ minutes, however. "*Lord St. Vincent*" was not unduly pressed as far as Woking in order to avoid overtaking a relief train for Bournemouth which had left Waterloo just ahead of the flyer. Speed rose to 68 m.p.h. at Weybridge, and then gradually fell away to 51½ m.p.h. at the summit of the long gradual rise past Brookwood and over the Chobham Ridge. So the 33¼ miles from Waterloo out to Farnborough took exactly 40 minutes.

The Bournemouth train, running on the slow line, was overhauled just beyond Farnborough, and the driver of "*Lord St. Vincent*," now assured of a clear road, spurred his engine to a truly thrilling effort. Speed rose to 69 m.p.h. on the level beyond Hook; Basingstoke, 48 miles, was passed in 53½ minutes, and the five-mile bank at 1 in 249 to Battledown Junction was climbed without the speed falling below 54 m.p.h. Then came some tremendous running over the switchback-like road on to Salisbury. Hurstbourne was passed at 80½ m.p.h.; there was a brief drop to 78 on the sharp rise beyond, and then No. 856 blazed away to a maximum speed of 91 m.p.h. through Andover.

Seven miles of steep climbing, mostly at 1 in 220 and 1 in 165, did not bring speed below 59 m.p.h. at Grateley, and then came another flying descent in which speed rose to 86½ m.p.h. below Porton. So Tunnel Junction, 82¾ miles from Waterloo, was passed in 83¼ minutes, and Salisbury was reached in 85½ minutes instead of the schedule time of 90 minutes. Allowing for the signal checks between Waterloo and Clapham Junction, the net time was only 83½ minutes for the 83¾ miles, and the 23½ miles of this thrilling last lap, from Whitchurch to Tunnel Junction, were covered at an average speed of 76 m.p.h. Throughout the trip the engine was far from being exerted. Even when running fast uphill the exhaust was quite inaudible from the front coach of the train.

We are indebted to Mr. O. S. Nock for details of this run.



L.M.S.R. 4-6-2 locomotive No. 6207, "Princess Arthur of Connaught," hauling the northbound "Royal Scot" up Shap. Photograph by Rev. E. W. Treacy, Liverpool.

New Signalling Schemes on L.N.E.R.

Colour-light signals and electrically operated points are gradually replacing those operating manually on busy sections of the L.N.E.R. At Newcastle an entirely new cabin, equipped with control panel with thumb switches controlling the points and colour-light signals, is being installed in place of the existing No. 1 box. No. 2 box and the Manors Junction box will be closed, but cabin No. 3 will be retained, with its miniature lever frame controlling the points, as at present, and the colour-light signals that are to be installed. The control of trains over the entire area will be by means of electrical circuits in the running rails that give visual indication in the signal boxes.

At Edinburgh the mechanically-worked box, which has 260 levers, is to be superseded by a new cabin immediately opposite having 207 miniature levers. Multi-unit colour-light signals are to be provided, and double-sided route indicators also will be installed. Electrical train describers are operated between the new cabin and St. Margarets, and London Road Junction box respectively and the lines of this section will be track circuited.

At Galashiels a new signal box that controls the signals and points in the area between Kilnknowe Junction and Selkirk Junction has already been brought into use. The searchlight type signals and points installed at the two Junctions are electrically operated by thumb switches. The lines are track circuited, and the positions of the trains are indicated on an illuminated diagram.

Roll-Top Roofs for Railway Coaches

The sight-seeing excursions arranged by the four main line Companies have become enormously popular and similar tours are now arranged in Germany. The German National Railways have introduced a Diesel observation car with a roll-top roof for operation on the Rhineland division, to enable passengers to view the beautiful wooded cliff scenery. To obtain the maximum window space special curved safety glass is employed between the cantrail and the frame of the roll-top roof. The roof divides at the centre and rolls up mechanically. A driver's portion is provided at each end, and the controls are arranged so that they do not project above the window level, thus assuring an uninterrupted view for the passengers.

Railcars with Trailers for G.W.R.

The G.W.R. are to introduce on the Lambourn Valley branch line a new type of railcar capable of drawing a "tail" load up to 60 tons in weight. The controls are duplicated so that trailing vehicles can be coupled on at either end, according to the direction of travel. Provision will be made for heating the trailing vehicles and for operating the vacuum brakes on them.

The French State Railways have already put into operation for a similar purpose, a batch of Diesel railcars with driving cabs at each end. Each car has accommodation for 100 passengers, and several of the cars can be coupled together, to form a complete train.

Rails 120 ft. in Length

The Skinningrove Iron Company, Saltburn, Yorks., recently rolled for the L.N.E.R. a quantity of steel rails 120 ft. in length. These rails are believed to be the longest ever produced in one piece. They have a standard section weight of 100 lb. per yd., giving a total weight for each rail of more than $1\frac{3}{4}$ tons.

The new rails are to be laid at a point south of Peterborough where expresses such as "*The Silver Jubilee*" regularly travel at speeds of 90 m.p.h. or over. They are being introduced experimentally as part of a plan to reduce the number of joints in the track. The object is to improve the running of the trains, and this will be effected both by making travel smoother and by lessening the amount of noise.

At the commencement of this century the standard main line rail length was 30 or 45 ft. Later this length was generally standardised at 60 ft., and a few years ago the L.N.E.R. were pioneers in this country in laying 90 ft. rails in their main line track at Thirsk. The new development marks a distinct advance in British railway practice.

The L.N.E.R. "*Coronation*" Expresses

The departure and arrival times of the "*Coronation*" expresses, the L.N.E.R. streamlined trains that are due to commence running in July, have been provisionally arranged as follows. The down train is timed to leave King's Cross at 4 p.m., calling at York at 6.42 and arrives at Edinburgh at 10 p.m. Important connections will be made at York from Leeds, Harrogate, Sheffield and Hull. The southbound train will leave Edinburgh at 4.30 p.m., and will arrive at King's Cross at 10.30 p.m. The average speed for both trains will be just over 65.3 m.p.h.

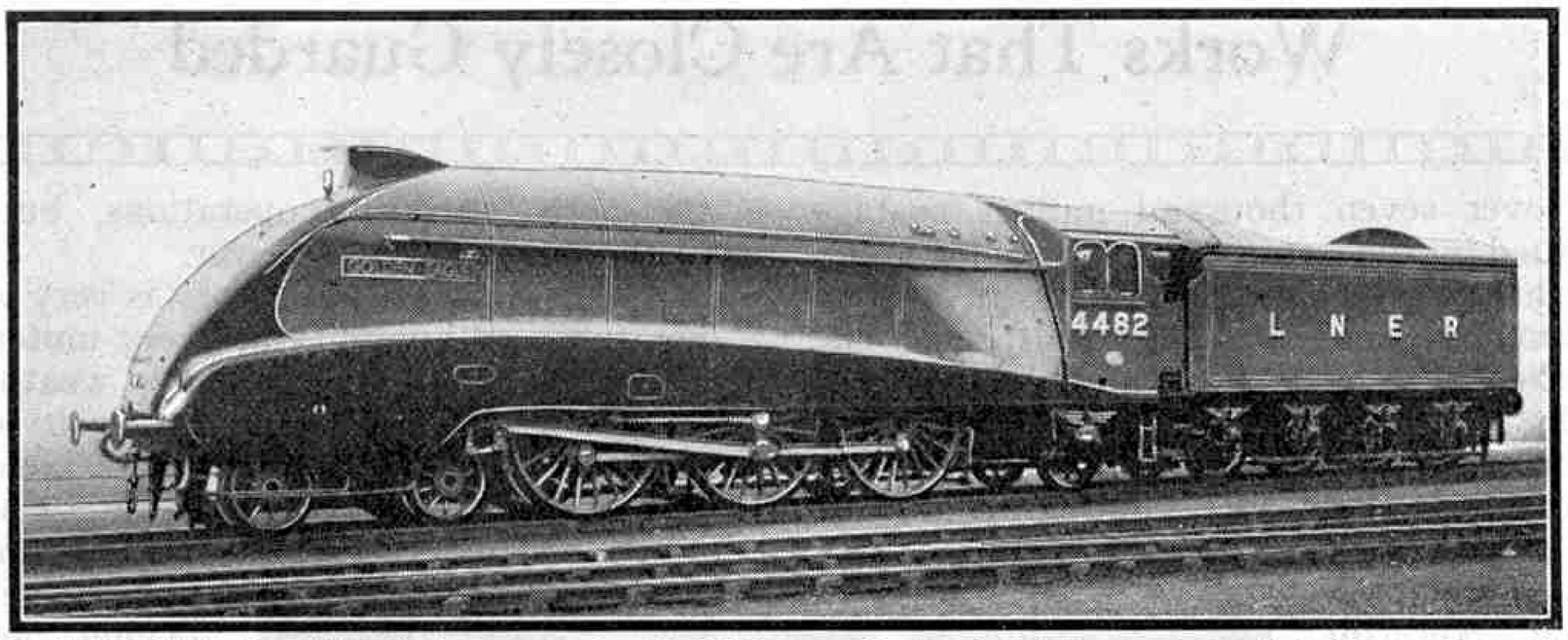
L.M.S.R. Locomotive News

The following new locomotives have been delivered from the Company's workshops and from outside contractors. Nos. 5284-5307 (5F-5F); 8071-88 (Class 8); and 2603-14 (2–6–4Ts) from contractors. From Crewe have been delivered Nos. 5738-5742 (Class 5X) and Nos. 8012-16 (Class 8). Nos. 2471-8 (2–6–4Ts) have been delivered from Derby.

The following engines have been condemned: Nos. 25625, "*Robert L. Stevenson*"; 25637, "*Edward Gibbon*"; 25671, "*Arethusa*"; 25672, "*Condor*"; 25706, "*Canning*"; 5927, "*Sir Francis Dent*"; 25730/94 and 25812/25, and eight more of the "George the Fifth" class.

New Underground Railway in Moscow

It has been announced recently that a new underground line is being planned for Moscow. It will be approximately 10 miles in length, and will follow a circle of boulevards round the city at depths varying from 82 ft. to 115 ft. There will be 10 stations on the new line.



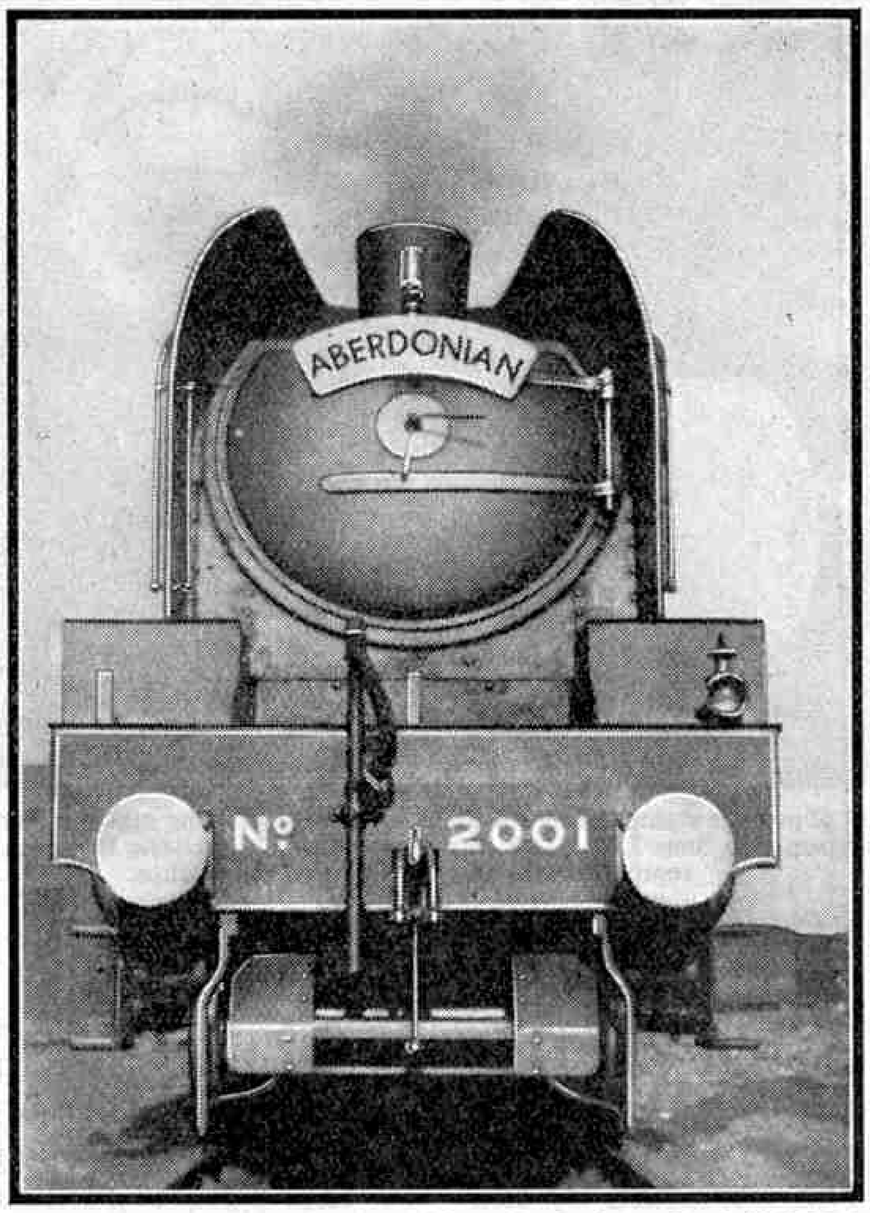
No. 4482, "Golden Eagle," the first of a new series of L.N.E.R. streamlined engines to be named after birds. These engines will haul the new "Coronation" Express between King's Cross and Edinburgh. Photograph by courtesy of the L.N.E.R.

Scheme for Improvement of L.M.S.R. Freight Terminals

Schemes for the modernisation of goods terminals at Manchester (Ancoats) and Derby (St. Mary's) are to be carried out by the L.M.S.R. A feature of these schemes is the introduction of machinery for the unloading of wagons.

At Derby it is intended to erect a large goods shed capable of handling 900 tons of freight daily. A new type of capstan and traverser will be installed.

The scheme for speeding up work at Manchester includes the provision of two capstans, 50 six-wheeled two-ton deck trolleys, five electric tractors and eight electric "mules." Lighting and other features also will be improved.



L.N.E.R. 2-8-2 locomotive No. 2001, "Cock o' the North." H.R.C. prize-winning photograph by D. F. Forbes, Edinburgh.

The "*Northern Belle*"

The "*Northern Belle*," the L.N.E.R. cruising train, will make two tours of Scotland during June, visiting the principal points of interest, including Loch Lomond, the Trossachs, and Loch Ness.

Britain's First Railway Staff College

The L.M.S.R. are to build a residential Staff College at Osmaston Park, Derby, for the training of railwaymen. The new College will be the first of its kind in this country, and is expected to be ready for occupation towards the end of the year. It will accommodate 50 members for the purpose of training, and instruction will be given in all kinds of railway work.

The principal of the College will be Colonel Lionel Manton, D.S.O., O.B.E., M.Inst.T., who has recently relinquished the post of Chief Engineer, Malta, to take up his new position with the L.M.S.R. His work has been connected largely with railway transportation, and for $4\frac{1}{2}$ years he was in command of the Railway Training Centre of the Royal Engineers.

The aim of the scheme is to establish the best practices and preserve the traditions of older experienced railwaymen, so that they will be available to the younger members of the staff at the start of their careers. This information will be available not only at the college itself, but also through the medium of standard text books on the various railway subjects. Text books of this kind are not available to-day, but will be prepared for the use of men attending the Staff College for instruction.

Brakes Operated by Compressed Air

The vacuum brake now in use on the Danish State Railways is to be replaced by a system operated by compressed air. The present system is not being abandoned owing to inefficiency, but because a higher speed limit is possible if the compressed air type brake is used.

More L.M.S.R. Caravan Coaches

Owing to the heavy demand for caravan coaches, the L.M.S.R. are augmenting their existing fleet in England and Wales by a further 42 vehicles, bringing the total number up to 192.

American 2-6-6-4 Articulated Locomotives

The Norfolk and Western Railroad of the U.S.A. have built and placed in service two freight 2–6–6–4 articulated locomotives weighing in working order $432\frac{1}{2}$ tons. These remarkable engines have an overall length of 125 ft. 7 in., and four cylinders of 20 in. diameter and 30 in. stroke. They develop a tractive effort of 104,500 lb. During a test by one of the locomotives a load of 7,500 tons was hauled at a speed of 64 m.p.h.

* * * *

A further 450 new containers are to be added to the L.M.S.R. stock, making a total of 7,966 in service. They will comprise 200 "F.M." type, 100 "A," 100 "B" and 50 "B.C." for cycles.

Printing Twenty Million Stamps A Day

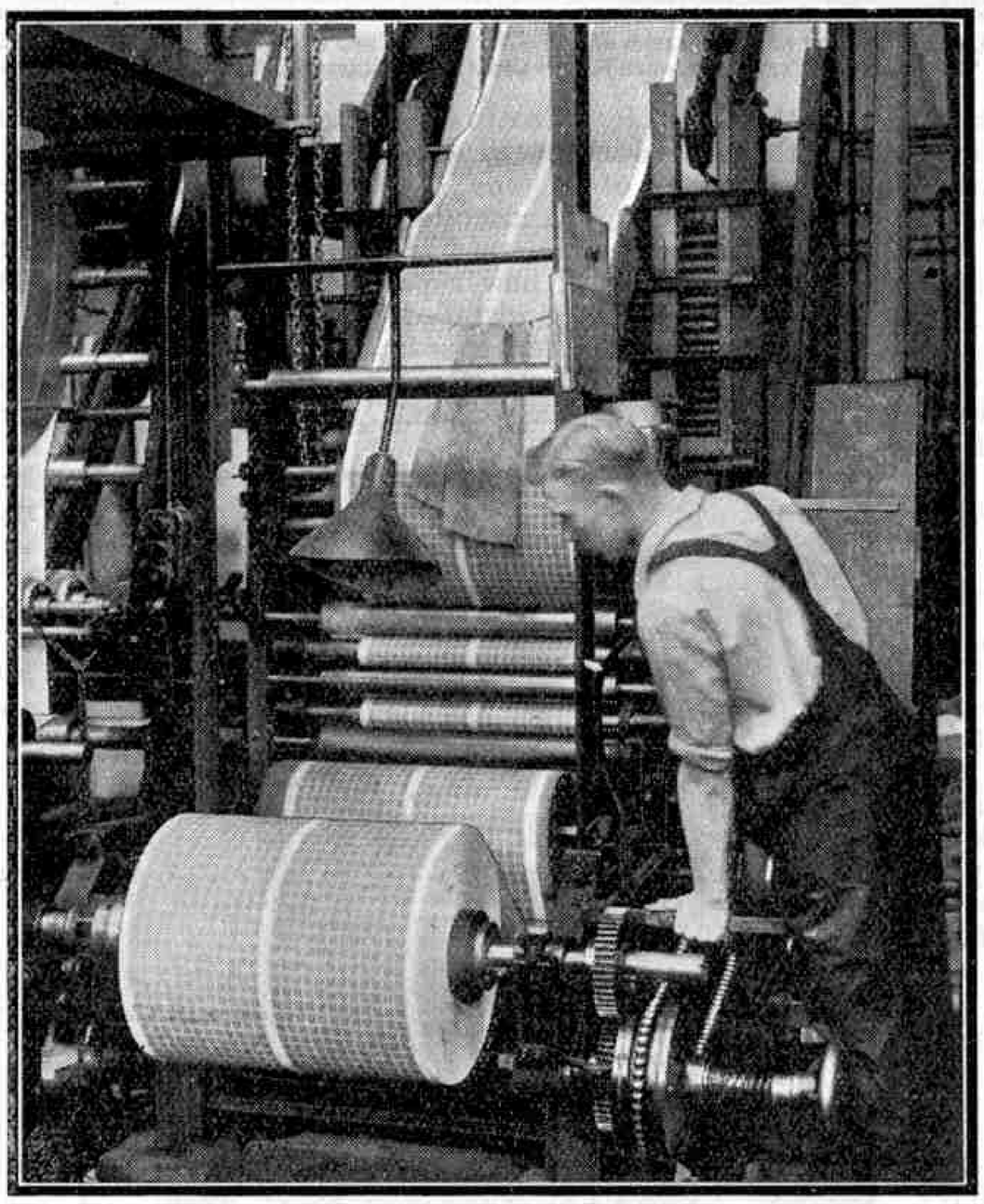
Works That Are Closely Guarded

EVERY year over seven thousand million postage stamps are issued by the General Post Office for use in this country. Of this total 90 per cent. is made up of those costing a halfpenny, a penny and three-halfpence. The last of these has the greatest sale, 2,750 million being used each year, while 2,500 million halfpenny, and 1,090 million penny stamps are issued. All these stamps are printed by Harrison and Sons Ltd., at their factory at High Wycombe, a long, low, extensive building that was specially constructed to house the delicate but powerful machinery used.

The factory is closely guarded, and entrance can only be obtained by means of a small door, through which nobody can enter without first satisfying an official of his identity and business. This official is a representative of the Stores Department of the Post Office, who control stamp production. The Stores Department have been in charge of the printing and distribution of stamps since the year 1914. Up to that time this work has been in the hands of the Inland Revenue Department, although the reason why this section ever had control not only of the stamps, but also of the stamped stationery, has always been a mystery. From the meagre information available it appears that previous to 1870 postage stamps were delivered by the contractors to the Inland Revenue Department at Somerset House, who then forwarded them to the General Post Office, to be issued to Postmasters.

In 1897 the accommodation for storing stamps at Headquarters became inadequate, and the Post Office asked the Inland Revenue Department to undertake the storage and distribution. This was agreed upon and the arrangement continued up to 1914. The work had by this time grown enormously, because of the expansion of Post Office activities generally and the introduction of additional denominations of stamps, and was too great for the system in use to be continued. Accordingly a committee of representatives of the Treasury, the Post Office and the Inland Revenue met to consider the matter. After a careful investigation they recommended that the Stores Department with its efficient machinery for distribution were a better section to undertake the work. At first the Stores Department was not responsible for supervising the actual printing operations, but later the whole of the work was taken over.

The interior of the factory is very warm, for the temperature and humidity are kept uniform throughout the whole building, independent of weather conditions. The stamp paper is extremely sensitive to atmospheric changes, and a roll printed in variable conditions would not register accurately in the subsequent operation of perforating. The temperature in the gumming room is high, due to the heat required for drying, and this must be maintained during all the other various operations, including the preparation of the paper and the cylinder, the printing and the perforation.



A sheet of postage stamps being rolled on leaving the printing machine at the works of Harrison and Sons Ltd., High Wycombe. The illustrations to this article are reproduced by courtesy of the Post Office.

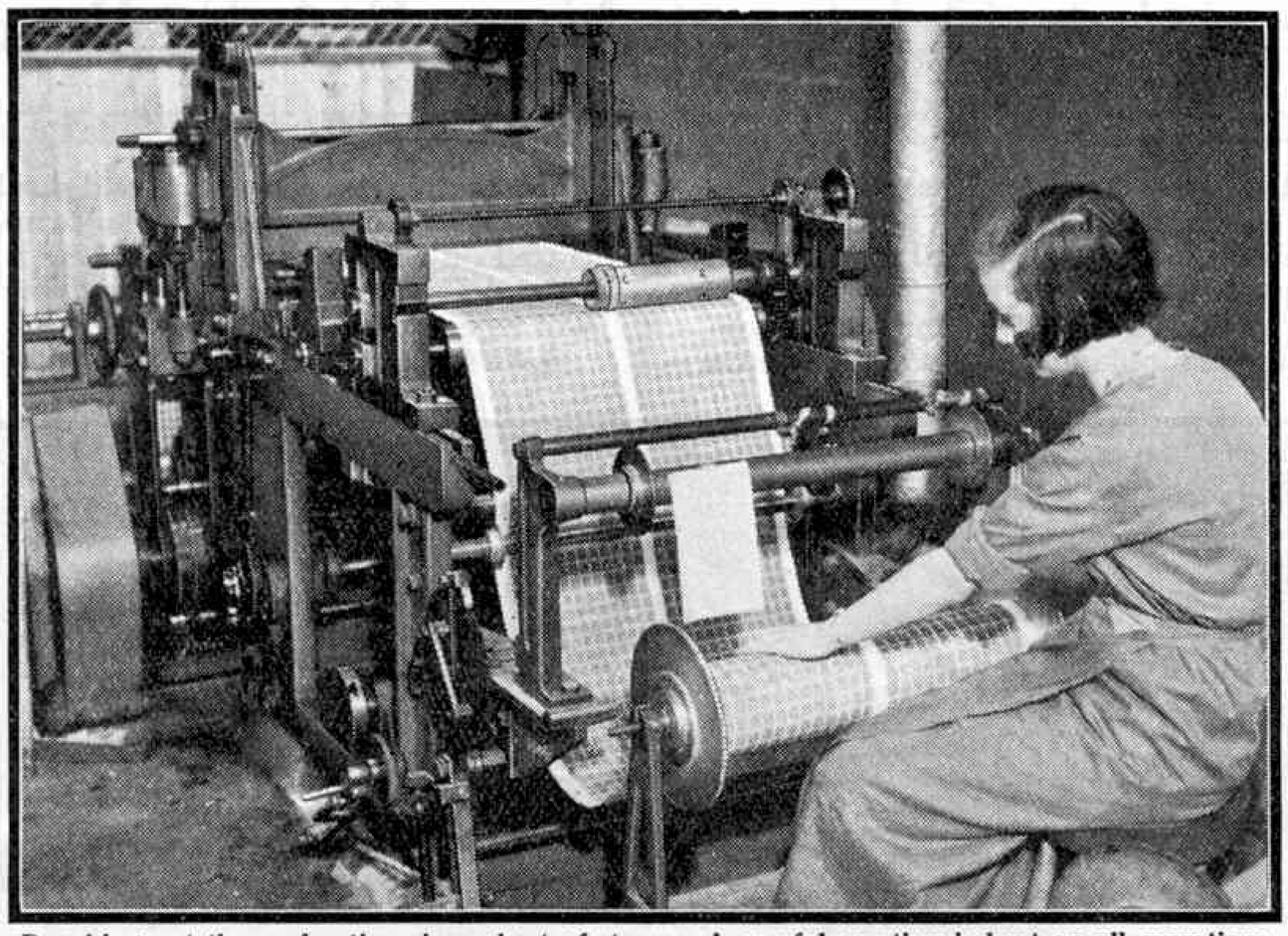
A special watermarked paper is used, and for many years past this has been supplied by an old-established firm of paper makers who for upwards of 200 years have manufactured paper for the Bank of England notes. The whole of the work is closely supervised by a representative of the Stores Department stationed at the mill. This official has in his custody the dandy rolls that impress the watermark on the paper when it is newly formed and still wet. These rolls are the property of the Post Office.

The paper is sent direct from the paper mill to the printing works in the form of 400-lb. rolls in sealed containers. These are all carefully checked, and every piece of paper has eventually to be accounted for, either as sheets, books or rolls of stamps, or as waste. The waste paper is returned to the mill and is re-pulped, for nothing is wasted. After the security labels on the great rolls of paper have been broken, a crane lifts them on to a machine for gumming. The gum used comes from the Sudan and is the purest gum-arabic obtainable. Frequent tests are made to ensure that its high quality is maintained. After picking up the gum the paper passes through a drying chamber and then over a cold roller to ensure pliability.

The rolls of gummed paper pass on to the fracturing machine, where the paper slides over a keen knife edge that cracks the surface of the gum into countless fragments, without harming the paper itself. This prevents stretching and curling at subsequent operations. A smooth finish is imparted to the other surface of the paper by a calendering machine. This consists of polished steel

rollers, through which the paper is threaded.

The next step is the printing. Before going into the machines, the rolls are first cut into two and have their edges trimmed. Postage stamps are now printed by the photogravure process, that is from a copper cylinder on the surface of which are etched myriads of minute squares. These squares are cells varying in depth and width, and it is this variation that controls the tone. Where the darkest tones are required the cells are deepest and widest and carry the greatest charge of ink for transfer to the paper. For lighter tones the cells are etched only to a microscopic extent, and between the two extremes there is an infinite range of cells, and consequently of tones. Since copper is a soft metal, the printing cylinders are chromium plated with the object of reducing wear and tear during printing operations.



Punching out the perforations in a sheet of stamps. A careful scrutiny is kept on all operations, and the sheets of stamps are checked as they come from each machine.

The ink used is tested frequently for colour and fastness, and is made so that any attempt to remove the cancellation marks from stamps shows at once. After passing under the printing cylinder the paper, now a continuous sheet of stamps, is passed through conditioned air and hung for a short time in long festoons for final drying. On these printing machines the papers receive serial or control numbers at regular intervals, and these form a check at a later stage. The stamps are then passed through machines that punch out the perforations, some of the machines perforating stamps in sheets, others in continuous rolls.

It is interesting to recall that it was Edwin Hill, the brother of Rowland Hill, the pioneer of cheap postage, who in 1850, in conjunction with Warren de la Rue, modified and improved the system of separating the stamps by means of perforations. The principle was invented by an Irishman, Henry Archer, some years previously, but Hill and de la Rue made the process practical, and their method was generally and officially adopted by the Post Office in 1854. It was early in 1855 that the printers, de la Rue, first supplied the Inland Revenue with adhesive surface-printed stamps, and were also instructed to submit proposals for a 4d. postage stamp similarly printed. Their suggestions were accepted, and during the next 25 years the firm gradually came to produce the postage stamps of all values higher than 2d., until finally, in 1880, they obtained for their "economical and rapid typographic method of printing" the contract for the lower values as well. These, from 1840, the year stamps were first issued in England, had been line engraved.

Every step in the various processes is carefully scrutinised, and as the sheets come from the machines they are counted. After checking they are passed on for trimming. Some of the printed sheets are made up into books of stamps, or split into rolls for the vending machines. The intricate apparatus used in these operations turns out over 13 million books, and more than 800,000 rolls every year. If a book or a sheet shows a defect, it is cancelled by black lines printed across the face of the stamps. The slightest sign of misprinting, variation of colour, white marks indicating a flaw in the paper, or the presence of a pin-point of oil leads to rejection. Very few imperfect stamps escape the keen eyes of these checkers. Defective impressions and stamps containing errors are most highly prized by the philatelist, but inspection of stamp dealers' catalogues shows that the British Post Office provides them with such varieties only on rare occasions.

Cutting sheets of stamps into strips, which are rolled for use in automatic machines.

The perfect sheets of stamps are counted, checked once more, and made up into parcels of 2,000 sheets each, the wastage being parcelled separately. The packets are sent daily to the stamp section of the Stores Department for issue as required by Post Offices throughout the country.

The designing of a new stamp is important work, so that the origins of the various stamps issued in England during the last century are of interest. The designers of the earliest stamps apparently sought for an ideal type for their picture rather than a realistic portrait. A good example of this is seen in the well-known profile of the young Queen Victoria on the first English postage stamp. It was the City Medal, by William Wyon, the medal engraver, struck to commemorate the first entry of Queen Victoria into the City, on 9th November, 1837, that gave Henry Corbauld, the designer, the inspiration for this stamp, one of the finest ever engraved. We are indebted to the Post Office and to the *"Post Office Magazine"* for the information in this article.

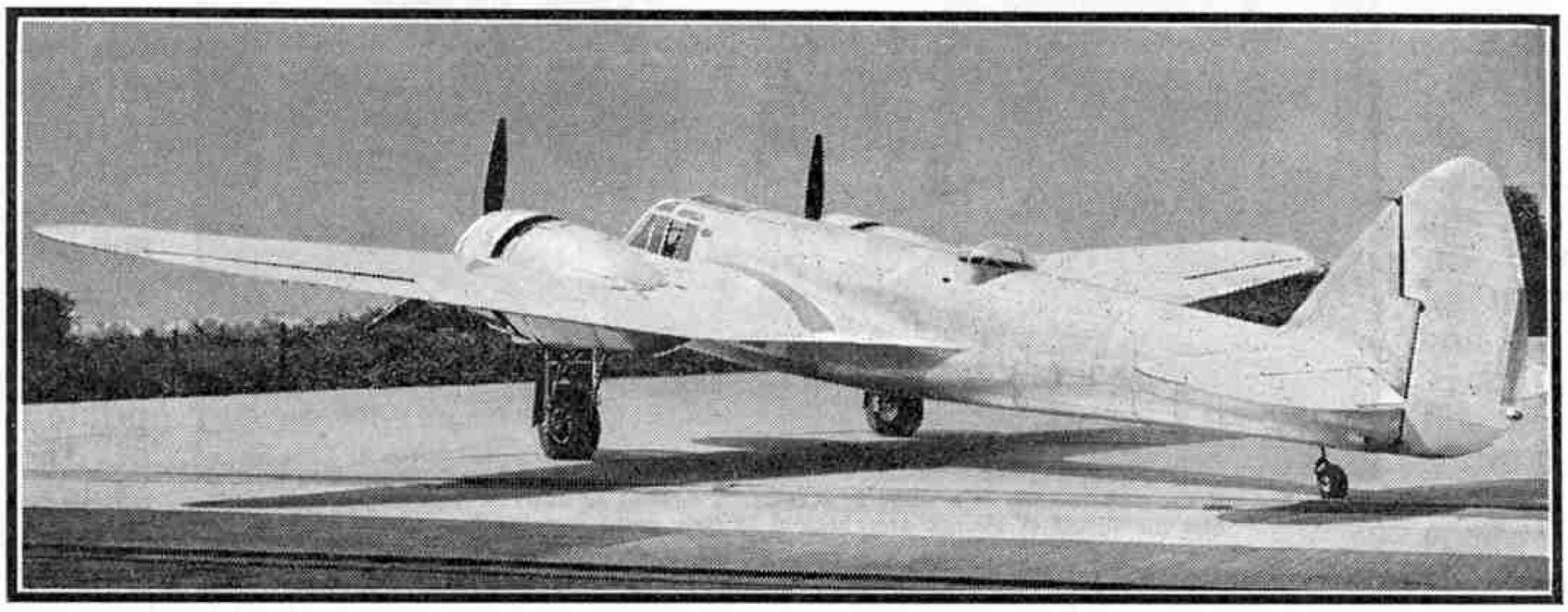
The Bristol "Blenheim" Monoplane

Interesting Origin of New R.A.F. Bomber

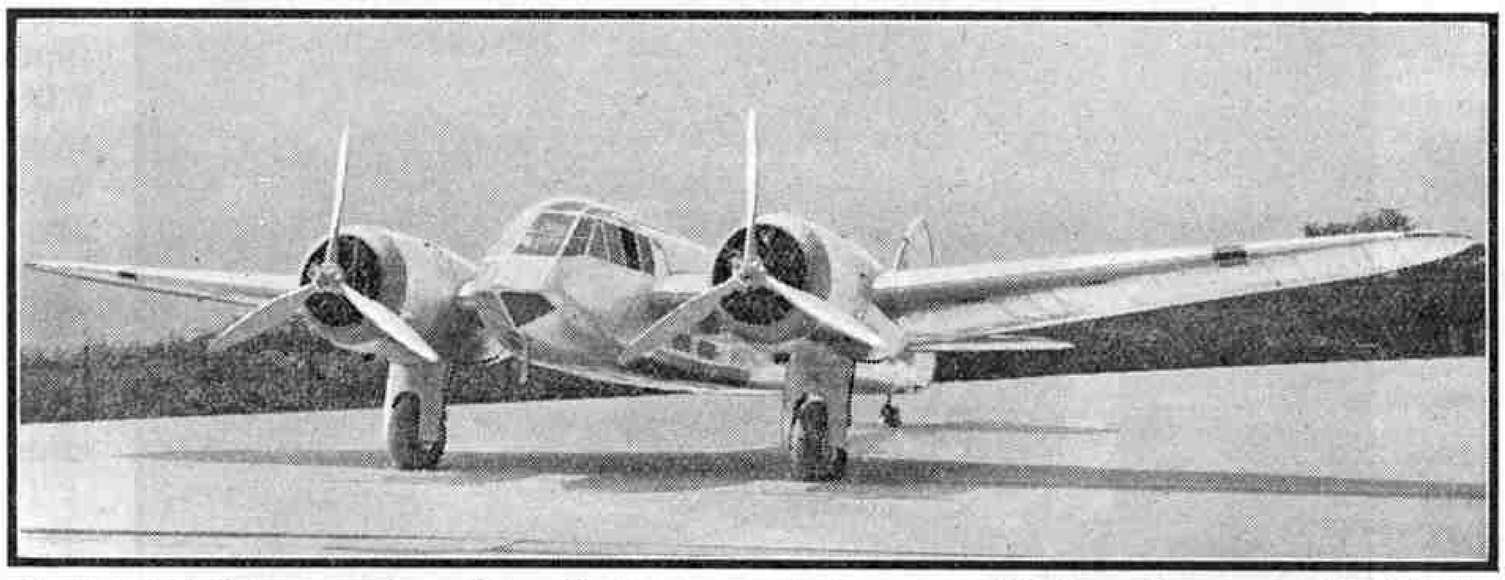
THE Bristol Aeroplane Co. Ltd., who have long been among the foremost British producers of military aircraft, a few years ago turned their attention to the subject of high speed civil aircraft suitable for the transport of either passengers or freight. After prolonged research they decided in favour of a machine of the monoplane type, and evolved an all-metal low wing monoplane of a new stressed-skin design. This machine, type 135 on the company's list, was to be fitted with two of the new Bristol "Aquila" sleeve valve engines, and was designed to carry sufficient fuel for long range flying. The passenger cabin was arranged to seat 10 people.

Before the new type was built, Lord Rothermere announced that he required a really fast modern aeroplane, and that he intended it should be a British one. After investigating various types he selected the Bristol 135 as being the best and most up-to-date, and modifications were made to the design to meet his particular requirements. The seating capacity was reduced from 10 to six, and the "Aquila" engines were replaced by the still higher performance Bristol "Mercury" type.

When ordering the machine Lord Rothermere stipulated that it must be built and equipped in a year; it was completed in 10 months. The modified machine was known as type 142, and a photograph of it appears on page 1?9. In due course "142" was sent to Martlesham, that final and exacting testing ground where all aircraft must pass a vigorous scrutiny and severe trial by the finest air pilots in the world in order to qualify for the essential Certificate of Airworthiness issued by the Air Ministry.



This three-quarter rear view of the Bristol "Blenheim" proves that even a bomber can be graceful in form. Several R.A.F. squadrons are to be equipped with this machine. Photographs by courtesy of the Bristol Aeroplane Co. Ltd.



The "Blenheim" is a monoplane of the mid-wing type, a wing arrangement that provides very good facilities for the storage of the bomb load within the fuselage.

Often many modifications are required before a new design succeeds in passing all the tests imposed upon it at Martlesham, but type 142 was an immediate success. The performance of the machine astounded the test pilots and the officials in charge of the station, for although it was an all-metal aeroplane, over 50 ft. in span, had two engines and carried six passengers, it was faster than the speediest fighters of the R.A.F., and its controllability was superb.

Martlesham wanted to know more about this remarkable machine, and Lord Rothermere was asked if he would loan it for further tests. When he heard of its wonderful performance, and of the immense interest it had aroused at headquarters, he generously presented it to the R.A.F., on behalf of the nation, and christened it "*Britain First.*" Then the official veil of secrecy descended. No facts or figures were published; no details of design or performance could be given out; and it was simply known that the newcomer was the fastest civil aircraft in the world.

The marvellous performance of "*Britain First*" convinced Air Ministry officials that the aeroplane would provide an excellent basis for the development of a first-class military machine. Subsequent research to that end resulted in the production last year of the Bristol "Blenheim," the twin-engined medium bomber illustrated on this page. This machine is now in full production at the Bristol Company's factory, and several squadrons of the R.A.F. will be equipped with it.

Like its prototype, the "Blenheim" is a cantilever monoplane of very clean external form. It is built entirely of metal by a method of stressed skin construction that has been developed by the company and gives a high structural strength for a low load. It differs from "*Britain First*" in being of the mid-wing type, an arrangement that makes it easier to store the bomb load within the fuselage. The special undercarriage is retractable into the engine nacelles by hydraulic means, with hand operation for emergency use, and the wheels are fitted with pneumatic brakes.

A transparent forward-sliding roof fitted just above the heads of the pilot and navigator, provides an easy means of entry or exit for the crew, either when the aeroplane is on the ground or in an emergency when it is necessary to escape by parachute. For normal entry, footsteps are provided in the side of the fuselage, and from these it is possible to step on the root of the wing. A walkway along the wing gives access to the sliding roof. Another hinged door in the roof of the fuselage, and just ahead of the rear gun turret, can easily be reached by the wireless operator and the rear gunner.

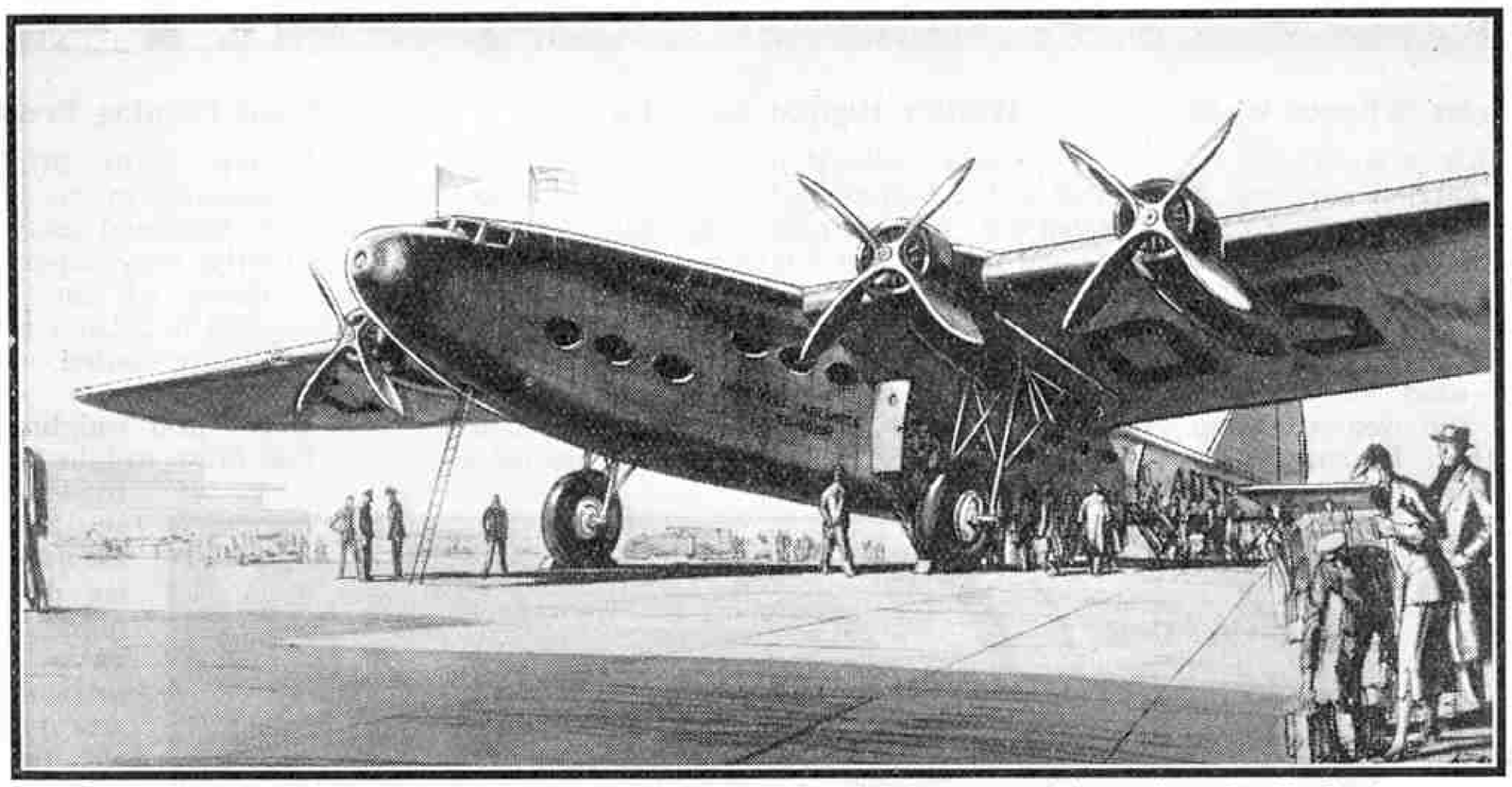
The pilot is seated in the nose of the machine on the port side, and sufficient windows are provided to give him an excellent view forward, downward, and to both sides. The transparent sliding roof and top corner windows give a good upward and backward view on both sides. The pilot can easily leave his seat when a change is made with the machine in the air, for the wide fuselage gives ample room, and the gun turret has been so designed that it is easy to enter and to escape from if necessary. Accommodation is available for a crew of three or four, as required, consisting of a pilot and navigator, wireless operator and rear gunner.

The overall dimensions of the "Blenheim" are: span 56 ft. 4 in., length 39 ft. 9 in., and height 9 ft. 9½ in. It is fitted with two Bristol "Mercury VIII" engines. These are nine-cylinder, radial, air-cooled units, which develop their maximum power of 840 b.h.p. at 2,750 r.p.m. at a height of 14,000 ft. They are fitted with close controllable cowlings and de Havilland-Hamilton controllable pitch airscrews. Performance figures cannot yet be published, as the aeroplane is still on the Air Ministry part publication list, but it is permissible to say that the maximum speed compares favourably with those attained by the most advanced fighters, and that the "Blenheim" is one of the most formidable weapons of air defence in existence.

New Monoplanes for Imperial Airways

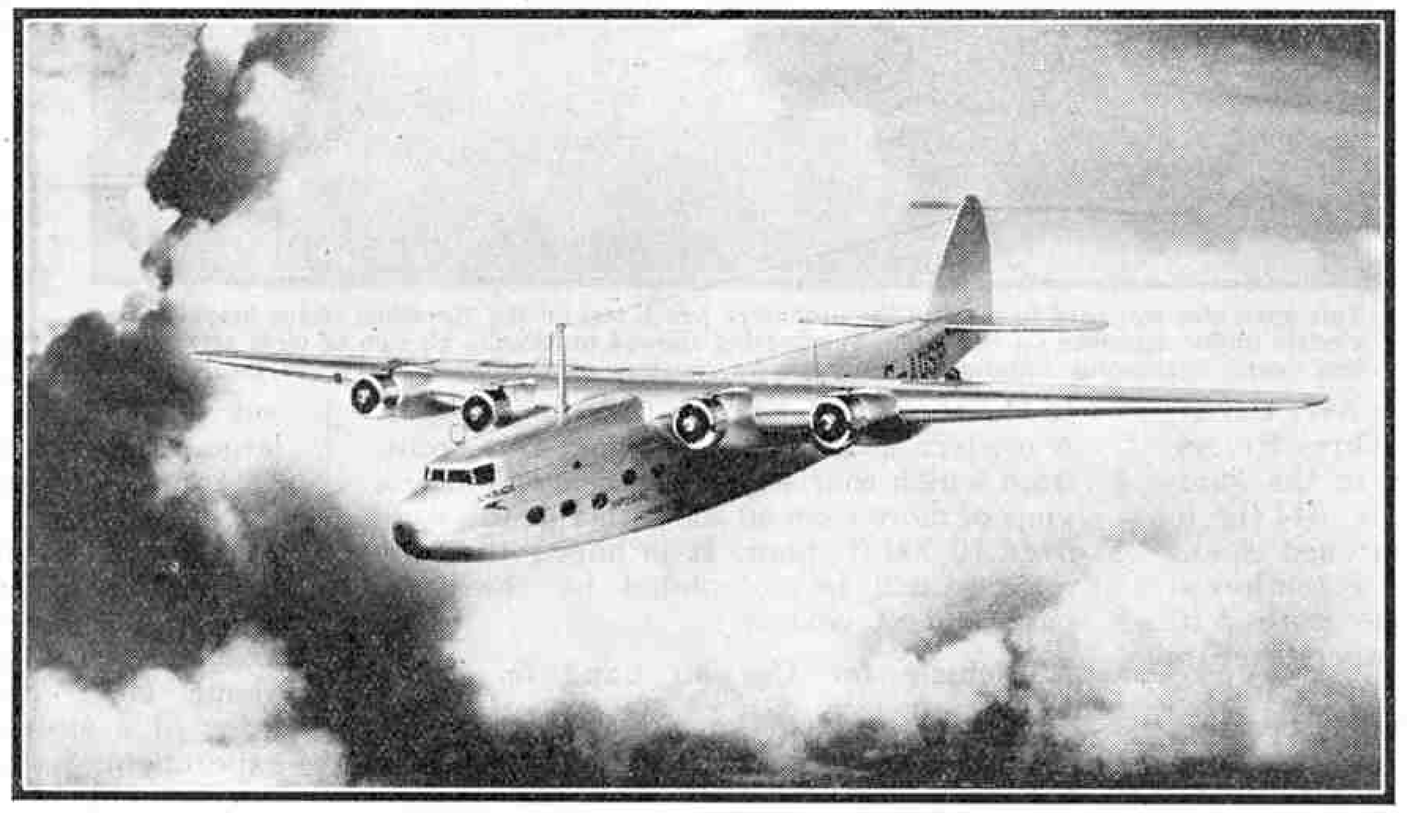
Fastest Aircraft of their Type

THE 40 new four-engined aircraft under construction for Imperial Airways in connection with the great Empire air scheme to be inaugurated this year, consist of 28 flying boats and 12 landplanes. The flying boats, seven of which are already in service, are being built by Short Brothers (Rochester and Bedford) Ltd., and were described in the December 1936 *"M.M."* Details are now available concerning the landplanes, which are being built by Sir W. G. Armstrong Whitworth Aircraft Ltd. These air liners will be known as the "E" class in the Imperial Airways fleet, and the first to be completed will be named *"Ensign."*



An artist's impression of an "E" class air liner. Twelve machines of this type are being built by Sir W. G. Armstrong Whitworth Aircraft Ltd. for Imperial Airways, by whose courtesy the illustrations on this page are reproduced.

The new air liners will be high wing cantilever monoplanes, with a wing span of 123 ft. and an overall length of 110 ft. Each wing will be built on a single metal box-spar of corrugated alloy sheet, and the massive fuselage will be an oval monocoque structure of light metal alloy, built of transverse frames and longitudinal stringers, with a smooth flush-riveted skin. The undercarriage will be the largest in the world, but in spite of its great size it will be retractable, and the retracting mechanism will be operated hydraulically from the control cabin. When the air liner takes off, the rear strut of each leg will fold and the wheels will travel backward and upward into the rear part of the nacelles of the two inboard engines.



"Ensign," the first of the new monoplane air liners, in flight, as visualised by the artist. The drawing brings out well the great span of the wing and the graceful form of the massive fuselage.

The power plant will consist of four moderately-supercharged Armstrong Siddeley "Tiger IX" engines, developing a total of 3,200 h.p. The engines will have controllable-pitch airscrews and will be mounted two on each side of the fuselage, in large nacelles built into the forward side of the wing mainplane spar. Thus equipped the "E" class air liner will be capable of approximately 200 m.p.h., and will be the fastest aeroplane of its type in the world.

Those of the machines used on the European routes will have a crew of five, consisting of Captain, First Officer, radio operator and two stewards, and will carry up to 42 passengers in four saloons. The other machines will be employed on the Empire services, and will have a crew of four, with accommodation, in three saloons, for 25 passengers on day stages and 20 in comfortable sleeping berths on night journeys.

The control cabin will be situated right in the front of the fuselage, and the Captain and First Officer will have side-by-side dual control equipment. A feature of the equipment will be an "automatic pilot," that will enable the machine to fly on a set course without human guidance. The radio operator will also be in this cabin. Immediately behind the control cabin there will be a snug smoking cabin, and just aft of this a large mail, baggage, and freight hold. Next will be a completely-equipped kitchen that will enable passengers to enjoy a full service of meals while in the air. After the kitchen there will be a promenade deck, toilet compartments, and an office for the ship's clerk. Then will come the midship and after cabins, with equipment enabling them to be used either as day saloons or sleeping compartments; and still further aft there will be another large hold for baggage and freight.

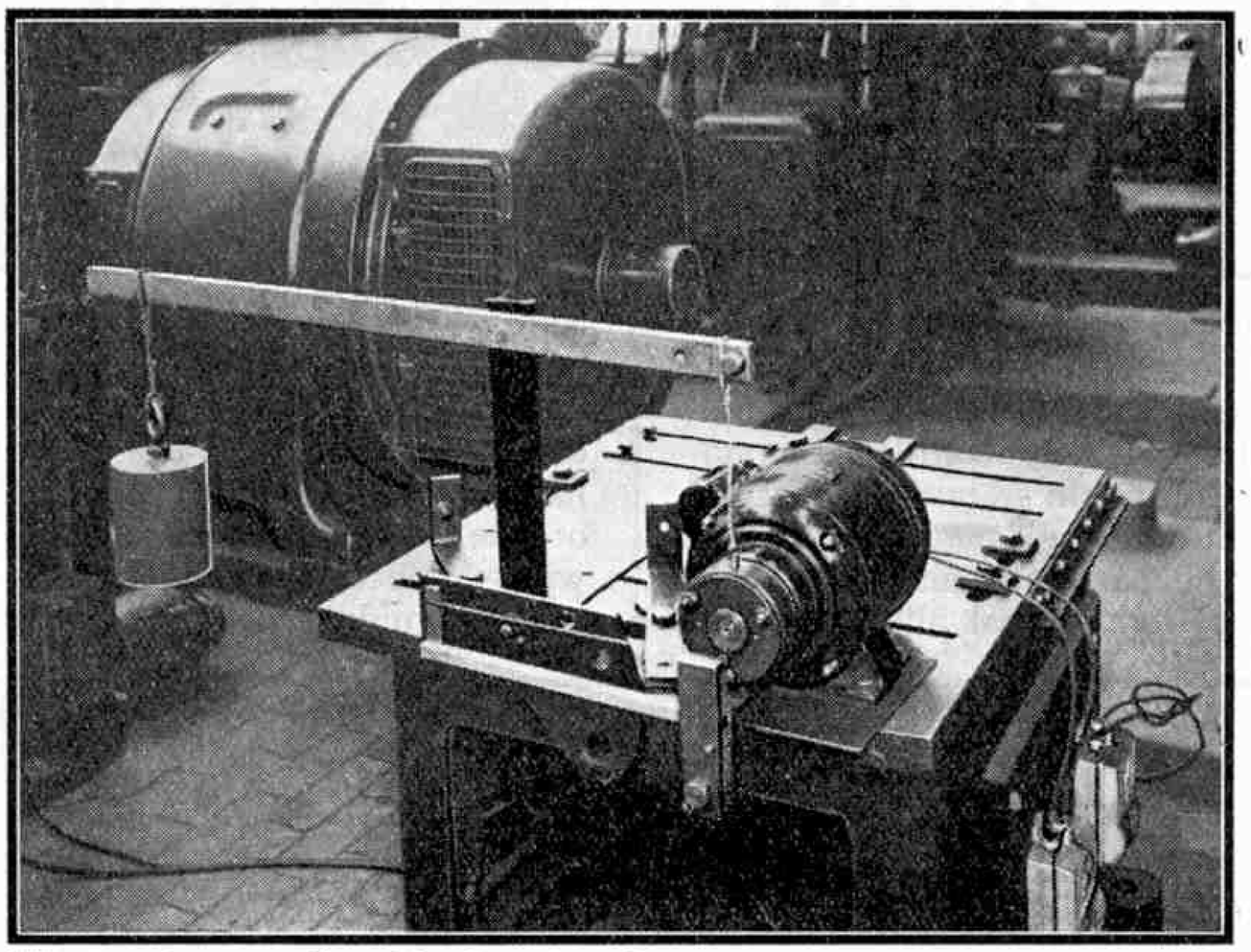
The great savings in time that will be effected when the new fleet of landplanes and flying boats for Imperial Airways are in service were dealt with in our article on the flying boats, referred to at the beginning of this article.

Motor Shaft Runs 1¾ Years Without Wear

The illustration on this page shows an interesting test being carried out on a Marathon sleeve bearing fitted to a Crompton electric motor. When a motor is transmitting power through belt drive to a line shaft much of the wear on the bearing is on one side only, and the apparatus shown was used to make a long endurance test of the wear-resisting qualities of the Marathon bearing.

During the test the bearing was subjected to an upward thrust through a weighted lever system, and was run continuously in the expectation that it would eventually wear to a stage when renewals would be necessary. After running day and night for 1¾ years the bearing showed no sign of wear, however, and the test was then abandoned, as there seemed every prospect of the bearing running indefinitely.

During the test the motor shaft made 1,350 million revolutions. The wear on the bearing was only six ten-thousandths of an inch, an amount equivalent only to the alteration in shape during the ordinary period of running in.



This apparatus was used in making the prolonged bench test on the Marathon sleeve bearing of an electric motor described on this page. The bearing showed practically no sign of wear after nearly two years' continuous running. Photograph by courtesy of Crompton Parkinson Ltd., London.

America's Longest Welded Bridge

An electrically-welded bridge, the longest yet constructed by this method in America, is now in service in Canada, carrying traffic over the St. Anne River, 30 miles east of Three Rivers. The new bridge forms a link in the Montreal-Quebec highway and is 644 ft. in length. It consists of six arched spans of steel girders, supporting a reinforced concrete roadway 24 ft. wide with 5 ft. paths on either side. The superstructure weighs more than 1,400 tons, and is supported on solid steel roller bearings at the piers to allow expansion or contraction due to changes in temperature. Between the coldest and hottest days of the year the bridge may change in length by as much as 8 in.

The materials used in the building of the bridge included over 300 tons of structural steel, 1,500 cu. yds. of concrete, 8,000 lineal feet of timber piles, and 1,760 sq. yds. of asphalt, in addition to a great quantity of timber.

The bridge was erected by the Dominion Bridge Co. of Canada.

World's Highest Cable Railway

A cable railway that when completed will be the highest in the world is to be constructed in Carinthia by the Austrian Government. The lower end of the railway will be near the Franz Joseph's Hohe, 800 ft. above sea level in the southern section of the Grossglockner mountain road, which was opened last summer, and from there nearly a mile of cable, without a single supporting pillar, will stretch across a huge glacier up to the terminus at an altitude of 10,500 ft. A modern hotel will be built at this point, from which tourists will be able to enjoy a view of more than 50 snow-clad peaks, each over 10,000 ft. high. It is hoped that the railway will be completed by the early part of next year.

A Vehicle for Use on Land or Water

A novel vehicle for use in marshlands has recently been built for the Gulf Oil Corporation in the United States. It is known as the "Marsh Buggy," and consists essentially of a power unit driving a set of four road wheels fitted with large tyres. The wheels are hollow and are made of sheet aluminium, and they act as buoyancy tanks with sufficient displacement to keep the vehicle afloat in water. The tyres are 10 ft. in diameter and 33½ in. wide. Over each tyre there are 12 detachable tread links that act as paddles when crossing water.

Giant Printing Press in South Africa

A new giant printing press capable of producing in an hour 60,000 printed, folded, trimmed and counted copies of a 64-page newspaper is now working in the offices of the Capetown "*Argus*." The press is a Goss machine, and 16 tons of paper are loaded on it at one time, each reel of newsprint containing five miles of paper and weighing about half a ton.

The press weighs 216 tons, and is 43 ft. in length and 10 ft. 8 in. in breadth and 2,800 lb. of ink are required to fill its ducts. When the five miles of paper on a reel have been used up, an intricate machine swings a new reel into position, and the beginning of the new reel is pasted on to the tail of the old one. The whole operation is performed by one man pressing a button.

Automatic pressure oiling systems circulate lubricant to various parts of the machine, and no less than 185 gallons of oil have to be used before the containers are full and the machine can be run. In addition over 1 cwt. of grease is required to lubricate other moving parts of the press.

Electrically Lighted Street Kerbs

An interesting system of street kerb lighting by electricity is being tried out at Canning Circus, Nottingham. A large traffic island, where seven streams of traffic converge, has been chosen for the experiment, and four lighting units have been installed. Each unit consists of a cast-iron kerb 18 in. long, fitted with a front of frosted plate glass ¼ in. thick, and contains a special 30-watt lamp about 11 in. long, which is placed in front of a stainless steel reflector. If the experiment is considered successful, the system will be extended to other busy sites in the City.

The illuminated kerbs are lighted from the usual street lighting time all through the night. They are visible for a distance of nearly 300 yds. to those approaching Canning Circus along any of the roads that converge there.

An account of a similar experimental installation at Kingston-on-Thames was given in the "*Of General Interest*" pages of the "*M.M.*" for October of last year.

Moscow to Become a Seaport

In Russia about 200,000 workers are now engaged on one of the largest engineering feats ever undertaken. This is the construction of the Moscow-Volga Canal, a huge enterprise that will be completed this year. A river will then be made to flow backward, and the waters of the Volga to merge with those of the Moscow River, and to flow past the Kremlin, in Moscow. The capital of Russia will become a seaport, to which vessels from the Caspian and White Seas will have access through connecting waterways.

As part of the scheme a huge lake is being completed near Moscow, to which the name of the Moscow Sea usually is given. Parks are being laid out around the completed sections, and buildings erected for administrative purposes and for housing the workers and employees. Powerful water pumps have been installed to force the Volga water into its new direction to the south. The town of Dimitrov, about midway along the Canal, had to be bisected by the waterway and a large bridge has been erected joining the two parts.

The magnitude of the project is shown by the fact that it includes the excavation of 135 million cu. m., or about 176 million cu. yds., of earth, and the laying of more than three million cu. m., or nearly four million cu. yds., of concrete. In addition, about 300 buildings of various kinds had to be erected, of which 100 were on a large scale, and a number of bridges over the Moscow River had to be completely rebuilt.

The whole of the work on the vast undertaking is highly mechanised. About 95 locomotives, 2,000 trucks, 5,000 motor lorries, and 14,500 horses are engaged on the scheme. Trains run day and night along the extensive system of constructional railways laid down, carrying earth, concrete and equipment, and about 150 powerful excavators tear away the soil, powerful streams of water then washing it away to the places where it is intended to go.

New Zealand's 100 Miles of Road Bridges

Some idea of the difficulty of road making in New Zealand may be gained from the fact that the road system incorporates 6,115 bridges, each more than 25 ft. in length and together forming a total length of considerably over 100 miles. The total mileage of constructed roads in New Zealand is approximately 51,400, of which about 3,000 miles are bitumen or concrete-surfaced, 35,800 metalled or gravelled, and about 12,700 consolidated but unsurfaced.

A Million-Volt Generator

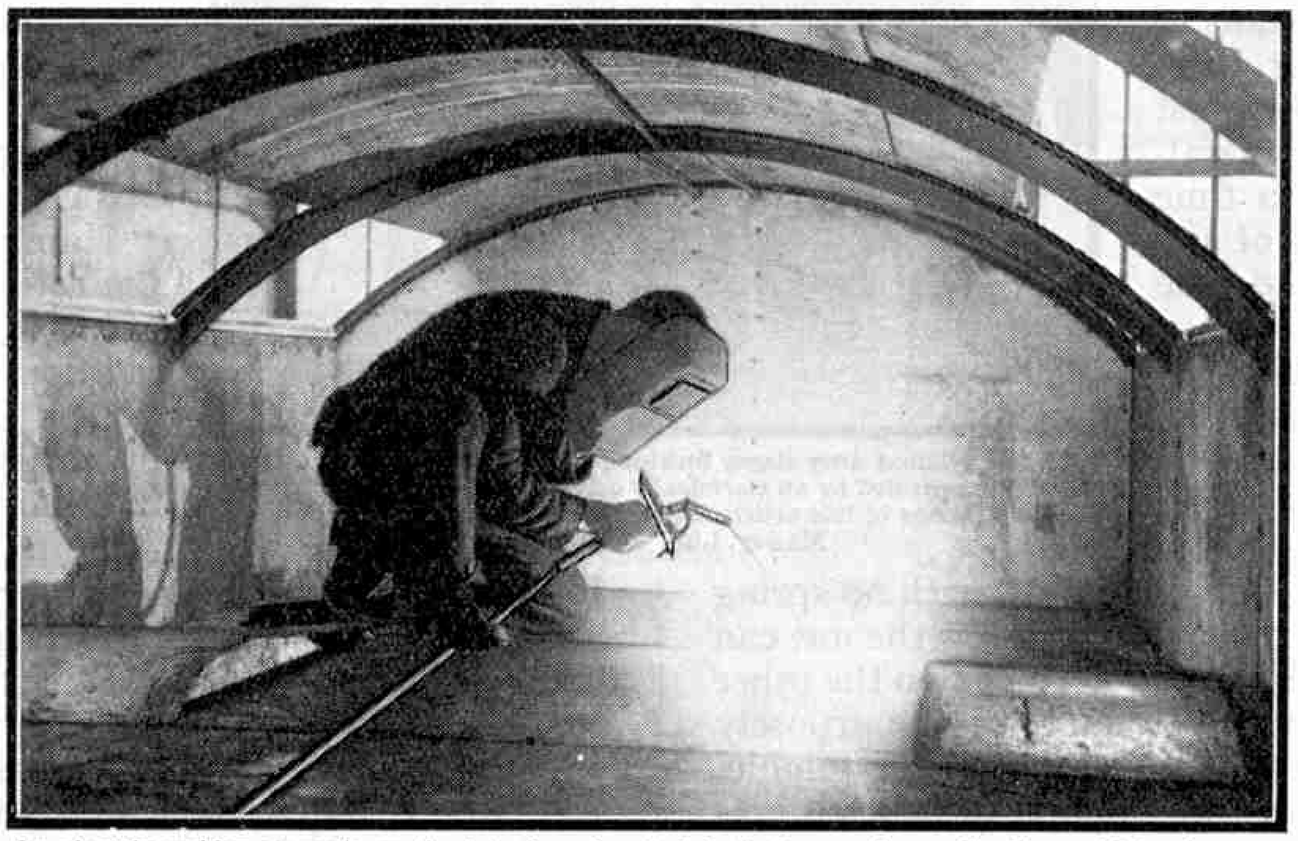
A great electric generator capable of producing direct current at 1,000,000 volts has been designed in America. It will be used in connection with a huge X-ray tube for producing short waves of great penetrating power for the treatment of cancer, and which will be of greater intensity than it is possible to produce by the combined output of all the radium at present available for medical research.

The X-ray tube to be used with the apparatus will consist of 20 porcelain sections, each about 12 in. in diameter, with diaphragms between each pair. These diaphragms will focus streams of high-speed electrons on to a gold target, from which an intensely penetrating beam of X-rays will be emitted.

* * * *

Ransomes and Rapier Limited, Ipswich, are building a giant stripping shovel for Stewart and Lloyd's steelworks at Corby, Northants. It will weigh 630 tons and will be the largest yet built in Europe.

The stern view and conveyor of a Lobnitz bucket dredge designed to extract gold from the gravels in the bed of the River Gik, in Jugoslavia. Part of the waste material is removed by means of a Mavor and Coulson conveyor. Photograph by courtesy of Lobnitz and Co. Ltd., Renfrew.



An electric welder at work on the interior of a steel body for a refuse collecting vehicle. A screen fitted with coloured glass protects his eyes from the intense glare of the arc. Photograph by courtesy of Erewash Electric Traction Co., Heanor, Notts.

The Earl's Court Exhibition Building

The new Earl's Court exhibition building now under construction in London is expected to be completed by the end of this month. It covers a site of nine acres, and has been described as the largest reinforced concrete building in Europe. The Central Arena of the building has a roof span of 250 ft. by 350 ft., supported at a height of 120 ft. without columns. Seats are provided around the Arena for over 20,000 people, and in it there is a swimming pool that measures 200 ft. by 100 ft., and has a capacity of about 2,000,000 gallons of water. The floor of the pool is made in three sections, and hydraulic gear is provided to bring these up level with the Arena floor, or to lower them in sloping formation to make the bottom of the swimming bath. The building has no provision for natural lighting, only artificial light being used.

The site of the new building consists of two separate pieces of land divided by the double electrified tracks of the West London Extension Railway, and one part of it is crossed by six other electrified lines. All the tracks converge on Earl's Court Station, from which covered passage ways are to be provided to enable railway passengers to have direct access to the exhibition building. A wide roadway over the railway tracks also is being built to give access for cars. The entire railway system has been roofed over, and on this roofing the exhibition building and its car parks are built. The main floor is about 15 ft. above the normal ground level.

Rock Breaker for Capetown Harbour

An interesting rock-breaking dredger is now at work in Table Bay Harbour, Capetown, breaking up and removing submerged rocks to facilitate the construction of two deep water berths for ocean liners. The dredger was sent out specially from England by the James Dredging Towage and Transport Company Ltd., of London and Southampton, and was towed to Capetown by the steam hopper *"Stonewell."* The vessel is 100 ft. in length by 28 ft. beam, and its rock-breaking machinery comprises two 10-ton rams capable of breaking rock at depths up to 60 ft. below the surface. Steam for operating the rams is supplied by a marine type boiler. In appearance the vessel is somewhat like an over-size pile-driver, with a tall gantry erected in the bows, and it is equipped with all working and manœuvring winches, anchors and guide wires.

Giant Hammers at Work

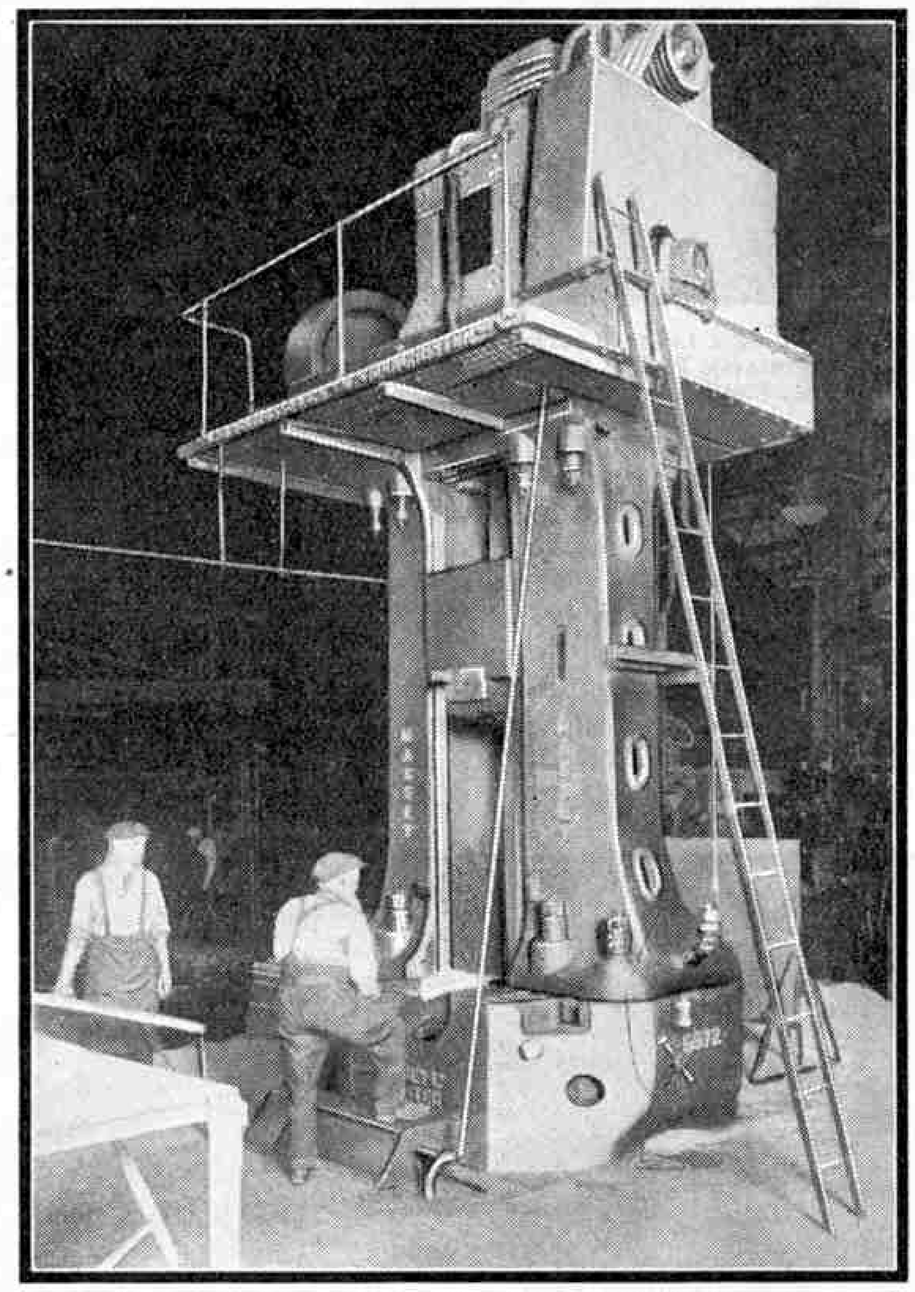
Enormous Power Under Perfect Control

THE spectacle of a giant steam hammer in action is one of the most imposing that an engineering works can present. It is thrilling to see a white hot mass of iron or steel withdrawn from a furnace for forging, and carried to the hammer by means of a crane that handles it with the greatest ease and places it exactly where it is required. When it is in position on the anvil heavy blows under complete control are dealt rapidly amid showers of large sparks, and the intense heat radiated while the forging is in progress causes everybody to remain as far away as possible.

Large power hammers have been developed from a very simple beginning. The hammer must have been one of the first tools Man ever made. Even in very primitive times he would learn that a more powerful blow could be delivered by a stick or a stone held in the hand than by the hand alone, and later he developed this crude tool for various purposes, such as breaking flints and shaping them into axes, knives and arrow heads. Eventually he fitted his hammer with a handle. This must have been a great step forward, and its value would be particularly appreciated with the discovery of metals and of means of smelting them from their ores. The hammer was one of the most valuable tools of the early metal-workers, whose activities in time developed into the crafts of the smiths, the armourer and the cutler.

To-day many different kinds of hammers are used. For instance, the hammer used for removing the wing nuts that hold a motor car wheel in place has a head of soft metal, usually lead, and the handle is stiff, with no spring at all. With it blows heavy enough to unscrew the nut can be given, while the nut itself is not deformed. On the other hand the head of a blacksmith's hammer is purposely made of the hardest and most durable material available, for its purpose is to change the shape of the objects struck with it.

A hammer blow may take the form of an "elastic" impact, the hammer head rebounding immediately, or of a "dead" blow, after which the hammer head remains in contact with the object struck. The first form of hammer driven by power gave a heavy stroke of the second kind. It was developed chiefly in connection with the Sussex Iron Industry, in the great days when forges with hammers driven by water power were built alongside many of the streams in the Weald. The tool was in effect a giant hammer of the traditional form, with a head weighing several hundredweights and a shaft or beam perhaps 9 ft. in length. This beam was pivoted near the end and remote from the head and was operated by means of a wheel provided with four projecting pegs, each of which in turn forced down the short end of the beam, thus raising the head and then allowing it to fall to strike the metal being forged on the anvil. Additional impetus was given by the rebound of a springy length of timber against which the shaft was forced as it was raised.



A 40 cwt. friction drop stamp finishing turbine blade stampings. This hammer is operated by an electrically driven hoist on the top platform. The illustrations to this article are reproduced by courtesy of B. and S. Massey Ltd., Manchester.

Where water power was not available steam soon came into use for operating large hammers. A cam on a rotating wheel raised the beam, lifting the hammer head to a height of about 20 in. and allowing it to fall, the operation being repeated by succeeding cams on the wheel. Other hammers of lighter build were capable of striking several hundred blows a minute. A few of these old-type hammers are still in use, and one that is at least 300 years old is employed in the manufacture of scythe blades in Sheffield.

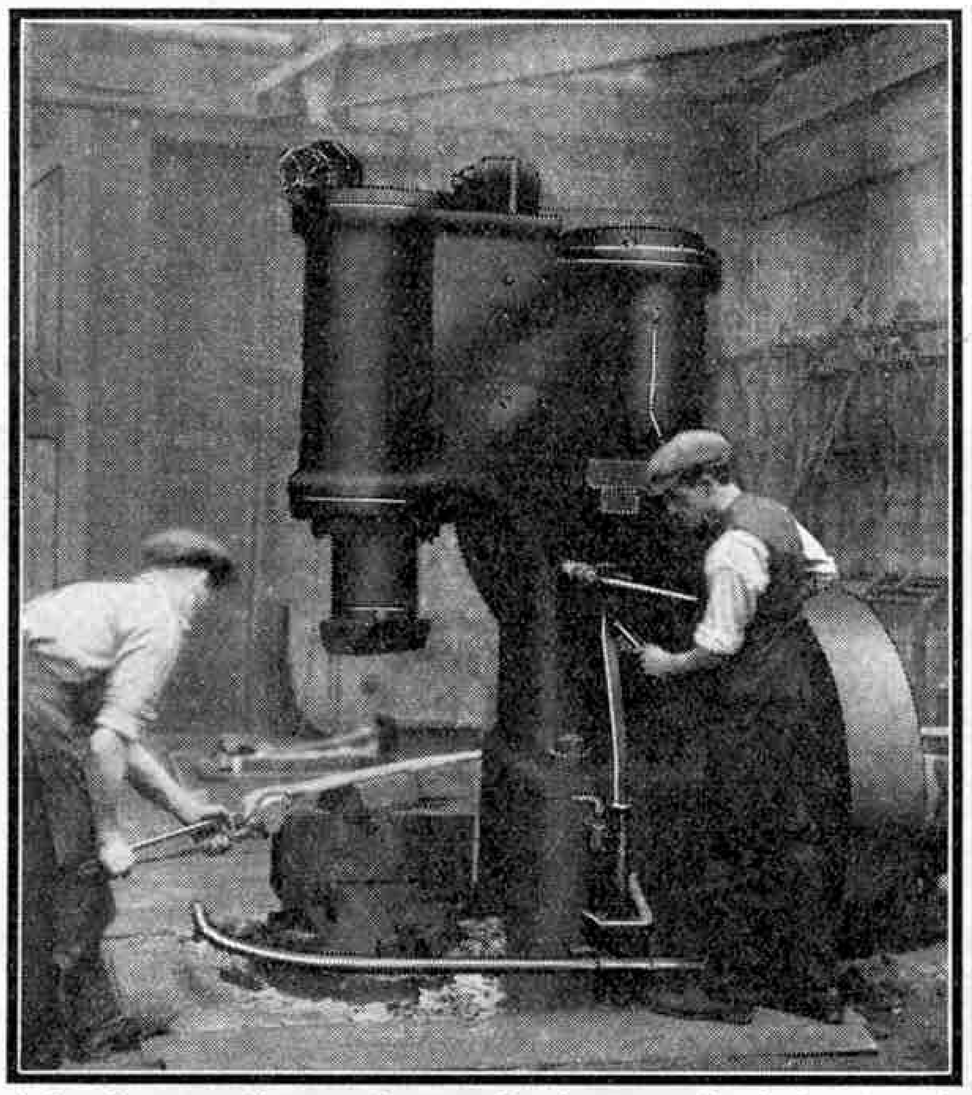
These hammers were known as "helve" hammers from the Anglo-Saxon word for "handle," or "tilt" hammers, because they tip up at one end. It is interesting to learn that the latter term still persists in the manufacture of steel, the hammering out into bars being still known as "steel tilting."

Hammers of this kind had their limitations, and modern methods of forging only started with the invention of the steam hammer by James Nasmyth in 1839. The invention was the result of the building of the steamship "*Great Britain*" for the Great Western Railway Company. Nasmyth produced machine tools for use in building the unusually large engines that were to be installed in the vessel. An unexpected difficulty was encountered in making the intermediate paddle shaft of wrought iron, for no shaft of its size had ever been forged, and Mr. Humphries, the engineer responsible for the machinery, was dismayed to find that he could not persuade anybody to undertake the work. Writing to Nasmyth on 24th November, 1839, he said: "I find that there is no forging hammer in England or Scotland powerful enough to forge the intermediate paddle shaft of the "*Great Britain.*" What am I to do? Do you think I might dare to use cast iron?"

This letter led Nasmyth to study the hammers in use, and he soon realised that they had insufficient range and fall, and that their blows were not powerful enough. The remedy was to contrive some means of lifting a heavy

block of iron or steel to a greater height, allowing it to fall upon the work, while being guided in its movement by some simple means. In little more than half an hour he had thought out his steam hammer and had made a drawing of the form he thought it should take.

In Nasmyth's hammer the hammer head was attached to the piston rod of a steam cylinder. When steam was allowed to enter the cylinder the hammer head was raised, and a slide valve then released the steam, permitting the hammer to descend by its own weight upon the work resting on the anvil below. Nasmyth sent a sketch of his hammer to Humphries, who was delighted with it. Unfortunately nothing further was done, for it was suddenly decided that the "*Great Britain*" should be fitted with propellers instead of paddle wheels, and there was no longer any need for the giant paddle shaft that had given rise to so much concern. Thus the steam hammer remained for the time being on paper, and there seemed little prospect of its being constructed and used.



A 5 cwt. pneumatic power hammer drawing out spring backs, the ends of which have previously been formed by stamping in dies. The foot lever extends round the base of the anvil.

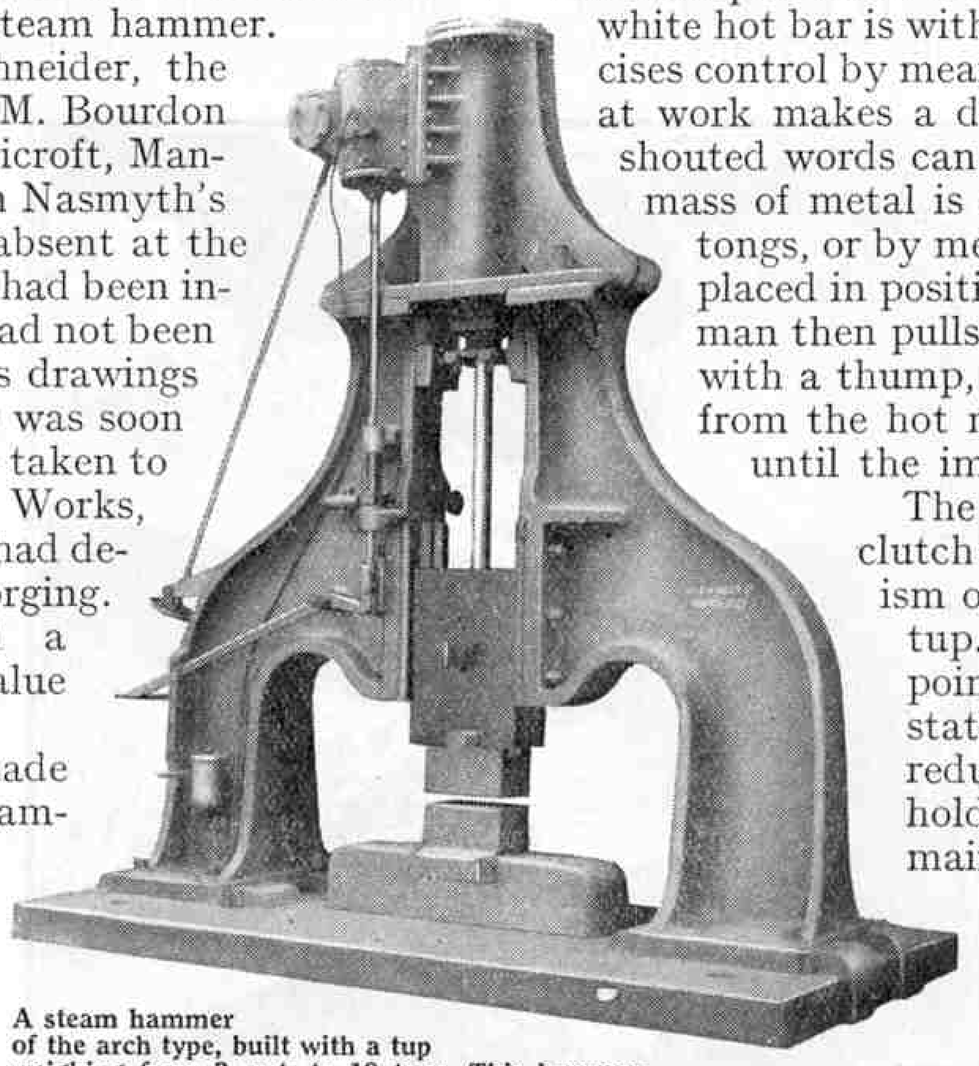
About three years later, while on a business visit to France, Nasmyth was shown round the Creusot Iron Works by M. Bourdon, the Manager. There he noticed an unusually large wrought iron crankshaft forged with a remarkable degree of exactness, and when he enquired about it was astonished to be told that it had been forged with his own steam hammer. He then discovered that M. Schneider, the owner of the Creusot Works, and M. Bourdon had visited his own works at Patricroft, Manchester, and had there been shown Nasmyth's drawing. The inventor had been absent at the time of this visit, and although he had been informed about it on his return, he had not been told that the visitors had seen his drawings and had made careful notes. This was soon explained, and then Nasmyth was taken to the forging department of the Works, where he saw the hammer that he had designed at work on another great forging. Shortly afterwards he secured a patent for his invention, the value of which was soon realised.

Very little alteration has been made in the general form of the steam hammer since it was first designed, but the means by which it is controlled have been improved, and its speed, power and certainty of action have been increased. In Nasmyth's hammer the steam was used only to raise the tup and to regulate its descent, but in modern hammers the power of the blow is increased by admitting steam above the piston during the descent. Compressed air is now also used for the same purpose, and the upper illustration on this page shows a pneumatic power hammer at work. In this type the electrically driven compressor is incorporated as a part of the hammer itself.

The degree of control in both steam and pneumatic power hammers is remarkable. A hammer can be made to crack the shell of an egg supported in a wine glass without breaking the glass, or to strike the most powerful blow of which it is capable, sufficient to pound a mass of white hot iron to any desired shape or form.

The illustration on the opposite page shows a modern drop hammer or stamp built by B. and S. Massey Ltd., Manchester. This is designed, not for "forging" metal out between plain striking faces, as in a steam hammer proper, but for "stamping" articles in dies, in which impressions have been cut to give the final shape of the articles required. The hammer head, or tup, as it is usually called, is a huge block of steel moving in vertical guides, and carries the upper die. It is rapidly raised to any required height, and when released falls upon the lower die, which is secured in the anvil block. The hot metal caught between the two dies is forced out into the impressions in them, and takes the desired shape.

The tup of such a stamp may weigh from 3 cwt. to 15 tons. Powerful and complicated hoisting gear is necessary to raise such huge weights, but this is so designed that the control of the stamp when in use is as simple as possible. The stamper takes charge of operations immediately a white hot bar is withdrawn from the furnace. He exercises control by means of signals, for a group of stamps at work makes a din like thunder, and spoken and shouted words can scarcely be heard. The white hot mass of metal is carried from the furnace in large tongs, or by means of overhead conveyors, and is placed in position on the lower die. The hammerman then pulls the control cord and the tup falls with a thump, causing a shower of sparks to fly from the hot metal. These actions are repeated until the immediate task is completed.



A steam hammer of the arch type, built with a tup weighing from 3 cwt. to 12 tons. This hammer follows the general outline of the tool originally sketched by Nasmyth.

The pulling cord operates a friction clutch that is a part of the lifting mechanism of the stamp, causing it to lift the tup. If the cord is pulled to a certain point in its travel, and is there held stationary, the friction of the clutch is reduced until it is just sufficient to hold the tup motionless. This can be maintained at the required height indefinitely until the cord is released. A spring then disengages the friction clutch, and the tup falls freely.

In smaller stamps an automatic gear can be arranged to pull the cord, much as a hammerman does in a hand-worked stamp, and a holding-up gear is provided and actuated by a foot lever. In conjunction these enable the stamper to control the stamp himself, without assistance, and the tup continues to rise and fall as long as the foot lever is pressed down.

Rearing Silkworms by the Million

A New British Industry

By L. Hugh Newman

MOST boys at some time or other have kept a few silkworms in a cardboard box. Feeding these creatures when they become big is no light problem, for even the few kept in this manner can eat several whole lettuces and handfuls of mulberry leaves every day just before they start to spin their wonderful cocoons. Looking after millions of these industrious little caterpillars is a far greater task, but it is done with success on a unique farm at Eynsford, Kent, owned by Lady Hart Dyke. At the end of each summer she has a mountain of silk cocoons to unwind, and silk produced on her farm last year is being used in the making of velvet for the coronation robes of the Queen and the Royal Duchesses.

Feeding silkworms by hand at Eynsford, Kent. On the left are straw arches ready to be placed over the silkworms when these are fully grown and about to begin spinning their cocoons

The British Isles are not the home of the silkworm, and it is remarkable to find the industry established here. The story of its beginning at Eynsford is of great interest. Lady Hart Dyke was keen on breeding the funny putty coloured caterpillars when a girl, and tells the story of how she traded her pencil box for the first batch of eggs she ever had. After she left school she did not lose interest in her hobby, but continued keeping a few silkworms in the attic at her home, where she watched their habits in different conditions. As the silkworm is not a native of Great Britain, and likes a warm climate to live in, it will be realised that her experiments were important if she were to succeed in breeding large numbers in this country.

Just four years ago Lady Hart Dyke started her farm in earnest, giving up a complete wing of stately old Lullingstone Castle, where the Hart Dykes have lived for centuries, as a home for her new family. Eight of the largest rooms were thoroughly disinfected and fumigated in order to make sure that the silkworms should not encounter disease germs, and all the windows were whitewashed to keep out the direct rays of the Sun, which are harmful to these creatures.

Lady Hart Dyke had previously been to Northern Italy, where she had seen how the peasants reared silkworms in the semi-darkness of their tiny cottages. She noticed that the worms like shade, and this gave her the idea of darkening her windows. As a matter of fact, this is a very important point, and probably accounts for her success in breeding silkworms in this country. They would probably never have thrived in Great Britain, after having been bred for centuries in Italian conditions, unless an attempt had been made to copy the shady atmosphere that they enjoy.

Before this pioneer returned to Great Britain, she was shown over the huge factories for reeling, weaving and dyeing silk. She became very enthusiastic, and even went so far as to place an order for thousands of mulberry trees, and to arrange that a reeling machine should be sent to Great Britain for her. A machine of this kind had never previously been brought to this country.

Lady Hart Dyke examining the cocoons from which the silk for the Royal Coronation robes will be woven.

On returning to Lullingstone Castle, Lady Hart Dyke at once gave directions for part of the deer paddock to be ploughed up in readiness for the consignment of mulberry trees expected any day from Italy. Several machines also had to be made specially for the proposed new industry, and the first to arrive was an incubator. This is now used every Spring for hatching eggs in Italian conditions. The temperature is raised by half a degree every day for 18 days, until suddenly from each of the thousands of little grey eggs, each like a pin head, emerges a tiny moving object, a silkworm so small that a camel hair brush has to be used to pick it up.

The entire family is transferred by means of brushes to small trays covered with young mulberry leaves cut up into fine

strips, so that the jaws of the tiny worms can get a good grip on the edges of the leaves when devouring their first meal. Another machine, rather like a chaff cutter, had to be invented to cut up the tough mulberry leaves into these strips.

To avoid fingering the worms while they are small, the trays on which they live are covered with sheets of perforated paper. Their food can be changed every day by lifting, tapping and replacing the paper on clean trays. This simple idea saves much of the work that attention to these millions of creatures otherwise would demand.

In the meantime work was going on in the eight large airy rooms, or "nurseries" as Lady Hart Dyke likes to call them. A wooden frame was erected down each side of every room in order to hold the large wicker trays that had been specially designed as "playrooms" for each brood of worms, when these were large enough to be left to their own devices. The frames or stands look like giant four poster beds. Their use was decided upon after many trials, as they seemed to offer the most healthy way of breeding in quantity, and the gangways between them were convenient for girls carrying baskets of freshly picked leaves at feeding time.

Nobody who has not actually been in one of these rooms could imagine how much noise silkworms make when they are nearly fully grown, and are hungrily eating piles of mulberry leaves. The sound is reminiscent of school boys at a half-term feast. The silkworms also are very sensitive, flinching when a door is slammed, or if the hands are clapped suddenly near them.

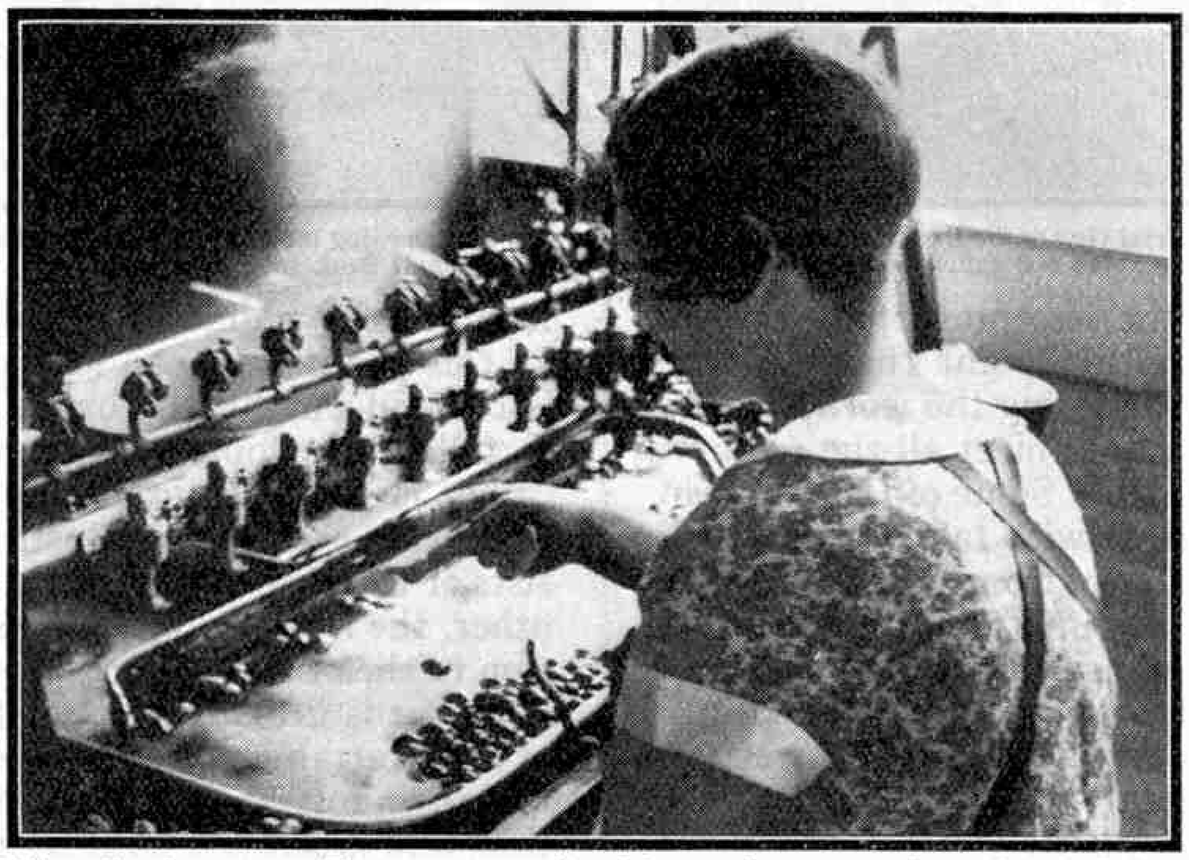
The only time when silkworms seem to stop eating is when they have to rest while casting their skins, when they have grown too fat for them. After the fifth rest of this kind they are fully grown. This is the most important moment in the silkworm farmer's career, for then they begin to spin their cocoons. It is easy to tell when they are ready to do this, as the silk can be seen shining through their grey skins, now tightly stretched over their long thin bodies.

In Italy children collect brush wood in the coppices, and this is tied into bunches and arranged all round the feeding trays, so that the worms can climb up and spin their cocoons among the twigs. This is really wasteful, for the worms use up silk in preparing places for the cocoons to rest in, making what resemble hammocks to support them. At Lullingstone long straw arches or "roofs" are placed across the feeding trays as soon as the worms appear to be ready. Under these roofs spinning can be carried out in complete privacy, and the cocoons can easily be detached from the straw in perfectly clean condition, ready for reeling.

Cocoons on tne straw arches specially designed by Lady Hart Dyke in order to avoid loss of silk.

When the first reeling machine arrived at the Castle nobody knew how to work it, so Lady Hart Dyke sent a girl from the village out to Italy to learn. In a few months' time the girl came back, and wanted to teach everybody Italian as well as the method of reeling silk. Reeling is highly skilled work. The "floss" is first stripped off without breaking too many threads, and then the cocoons are soaked in boiling water for a few minutes. When they have been thoroughly wetted a girl picks them up, one at a time, and throws them on to specially notched wheels that are rotating continuously. Each thread is drawn through a hollow spindle and carried over a series of small pulley wheels to a skein winder.

From time to time a sample skein is taken from the machine to test its weight, which varies according to the number of threads in it. If the sample is above or below the standard recognised weight, the silk being reeled will be valueless. For this reason the reelers must be skilled workers, knowing just how to feed the cocoons on to revolving wheels at exactly the right speed.



Silk reeling in progress. The cocoons are dipped in very hot water, after which the leader threads are "thrown" on the rotating wheels of the reeling machine.

The silk when reeled has to be freed from gum, dyed and woven, and these processes are carried out at Braintree, Essex. It is an interesting fact that besides the familiar gold cocoons there are those of silkworms, from various parts of the world, that produce such lovely colours as pink and pale green, right down to snow white. Unfortunately these are not of any special value, as the colour fades very quickly, and the silks have to be bleached before anything can be done with them.

Although Lady Hart Dyke realises she will never be able to produce enough silk to provide every lady in the land with a pair of real British silk stockings, she believes in the old saying that quality is better than quantity.

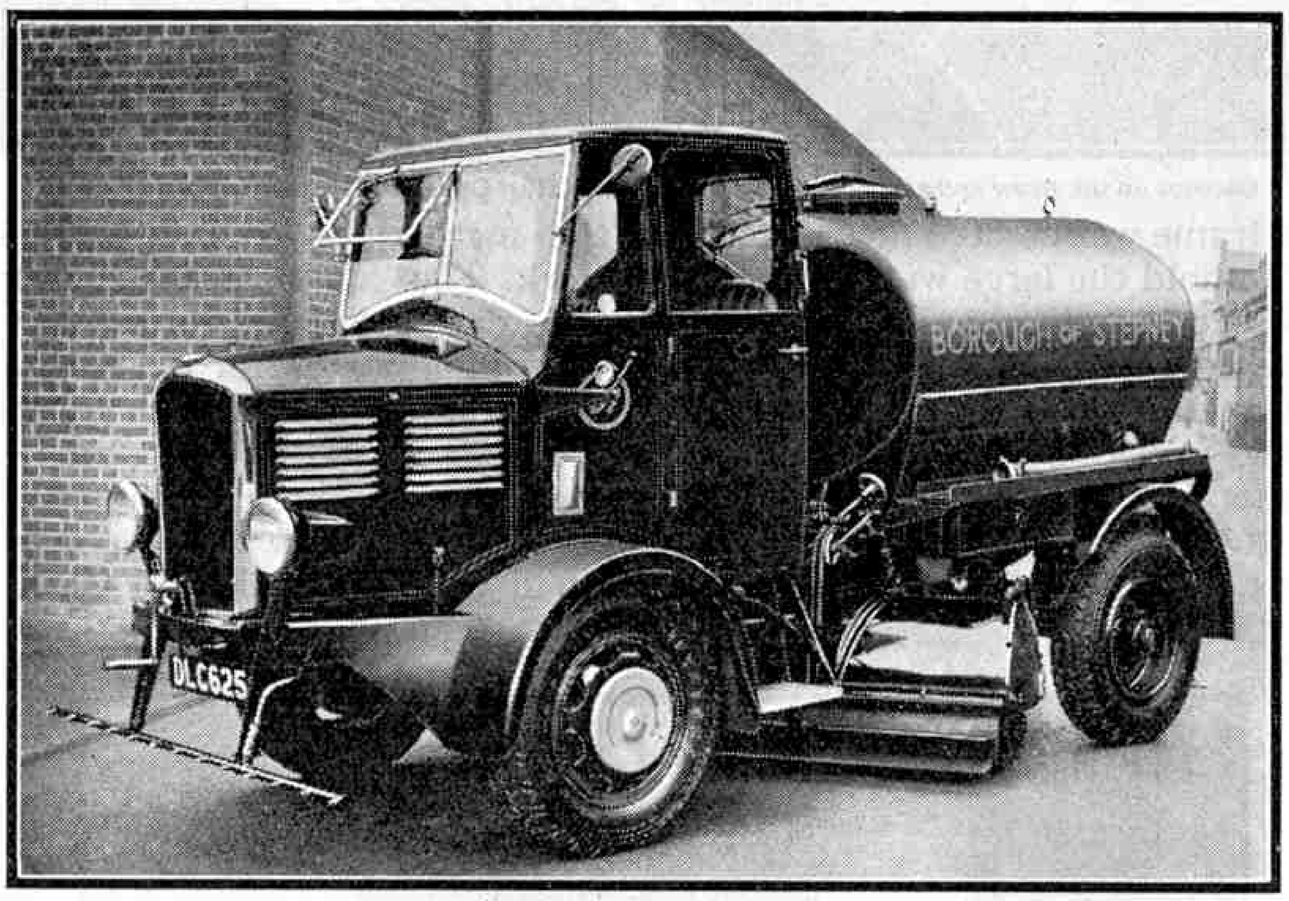
Modern Street Sweepers

Powerful Vacuum Cleaners to Remove Litter

AN astonishing accumulation of dirt and waste litters our streets at the end of every day. It includes millions of tramcar and bus tickets, spent matches, cigarette ends, scraps of paper and the debris of materials of all kinds carried through the streets in vans and lorries, or used in shops, warehouses and factories. Smoke and soot add to the effect, and in rainy weather mud increases the general discomfort, while a strong wind makes us realise forcibly how much dust there can be in the atmosphere.

Our streets have to be cleared of all this dirt, and how great is the task of removing it can be realised from the fact that the cities and towns of England spend nearly £7,500,000 a year on street-cleaning services. For every thousand people in these places 14 cwt. of sweepings are taken up daily, or an average of 1½ lb. for each individual, and the cost works out at over £10 a ton.

There are thousands of miles of streets to be cleaned, and as this must be done with the least inconvenience to road users, the work is carried on at night. Then only a few hours are available, and many specialised types of motor vehicle have been introduced to speed up both the sweeping of the streets and the removal of litter. Another point that must be borne in mind is the necessity for doing the work cleanly.



A general view of the Dennis Street Sweeper from the near side, showing the front sprinkler fed from the 500 gallon tank. Photograph by courtesy of Dennis Bros. Ltd., Guildford.

No single standard vehicle would meet all the requirements of street cleaning authorities. Some of those now in use are large road sweepers, fitted with tanks from which water is sprayed through nozzles in front of the brush, in order to prevent dust from rising into the air as it is disturbed. Others collect the sweepings mechanically, and do not merely push them into the gutter, to be loaded into another vehicle and taken away. Certain sweepers of this type are in effect giant vacuum cleaners, for dust is taken up by a suction plant.

A modern road sweeper that creates no dust as it works is the Dennis Street Sweeper illustrated on this page. This carries a tank holding 500 gallons of water, which flows down to a sprinkler and is sprayed over the road in advance of the revolving brush, where it wets the dust and prevents it from being scattered. There is also a pump for flushing gulleys with water under pressure forced out through delivery heads at the near side of the vehicle.

This sweeper has a wheelbase of 9 ft. 6 in. It is driven by a four-cylinder engine that also provides power to rotate a line of brushes sweeping a track 6 ft. wide. The brushes are set at an angle, so that refuse is swept to the near side, or into the gutter. They are suspended from a spring-loaded mounting, raised or lowered as required by means of a hand lever in the cab, and are driven from a power take off behind the gear box of the motor. When necessary a new brush can be inserted and the vehicle returned to service within a few minutes.

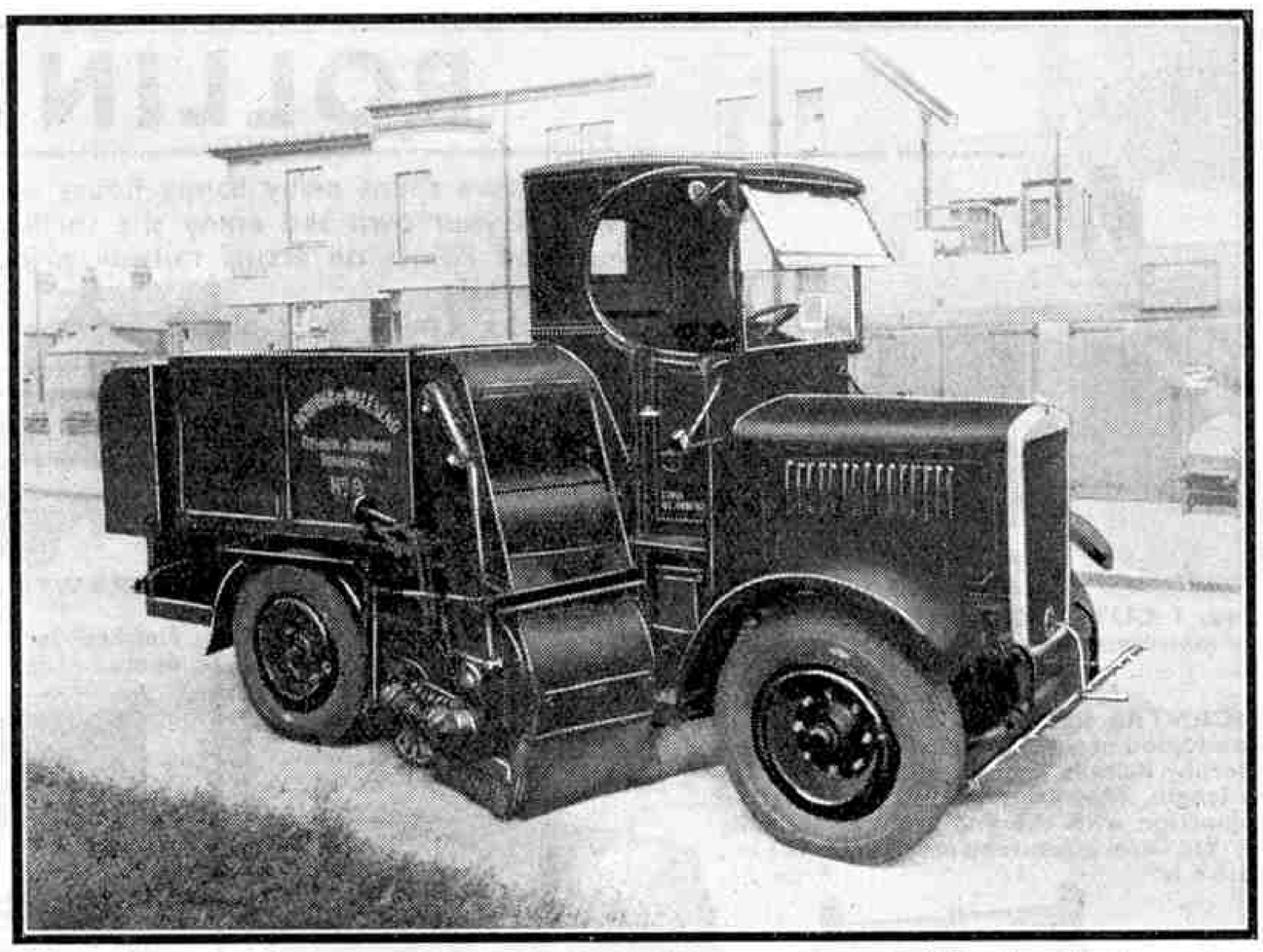
A motor vehicle that not only sweeps, but also picks up the refuse, is the "RSC" Road Sweeper and Collector, made by Karrier Motors Limited, and shown in the upper illustration on the opposite page. The revolving brush of this vehicle consists of seven sections mounted on a flexible shaft that adjusts itself to the curve of the road. Thus each section always fit closely on the surface, and no part of this can remain unswept even if it is below the general level. As usual, the brushes are set at an angle to the direction of travel, but the sweepings are moved outward from the gutter, and towards an elevator on the off side of the sweeper that lifts them into a side-tipping receptacle forming part of the truck body. While sweeping is in progress, water from a tank at the rear is sprinkled across the track just in front of the radiator. The driver sits on the near side. In this position he can look down into the gutter, which is cleaned out by the brush he operates, and so is able to follow the course of his sweeping.

The elevator is directly opposite the end of the brush, a position seen in our illustration of this vehicle. It consists of three sets of rotating vanes, placed one above the other, the intermediate set rotating in the opposite direction to the others. Hinged to the casing at the bottom is a pan that is lifted quickly at frequent intervals by means of a cam arrangement. Refuse swept up by the road brush is thrown forward on to the pan when it is in its low position, and is scraped off it by the vanes of the lowest rotor when it is lifted. The rubbish is then carried round by the vanes of the three rotors in turn, the highest of the three throwing it into the body of the machine with sufficient force to take it towards the rear, so that it does not clog the opening. When the sweeper is fully loaded, the brush is raised, and the vehicle is driven to the dump. There the bolts of the door of the side-tipping body are withdrawn, and the contents are then discharged.

Karrier Motors Limited manufacture other types of vehicle for sweeping and collecting, and for road sprinkling. One of these is used as a road washing plant. It has

four washing nozzles in front of the road brush, and the one on the near side can be used independently for flushing gulleys and gutters. All the sprinkler heads and washing nozzles are controlled from a convenient position near the driver's seat.

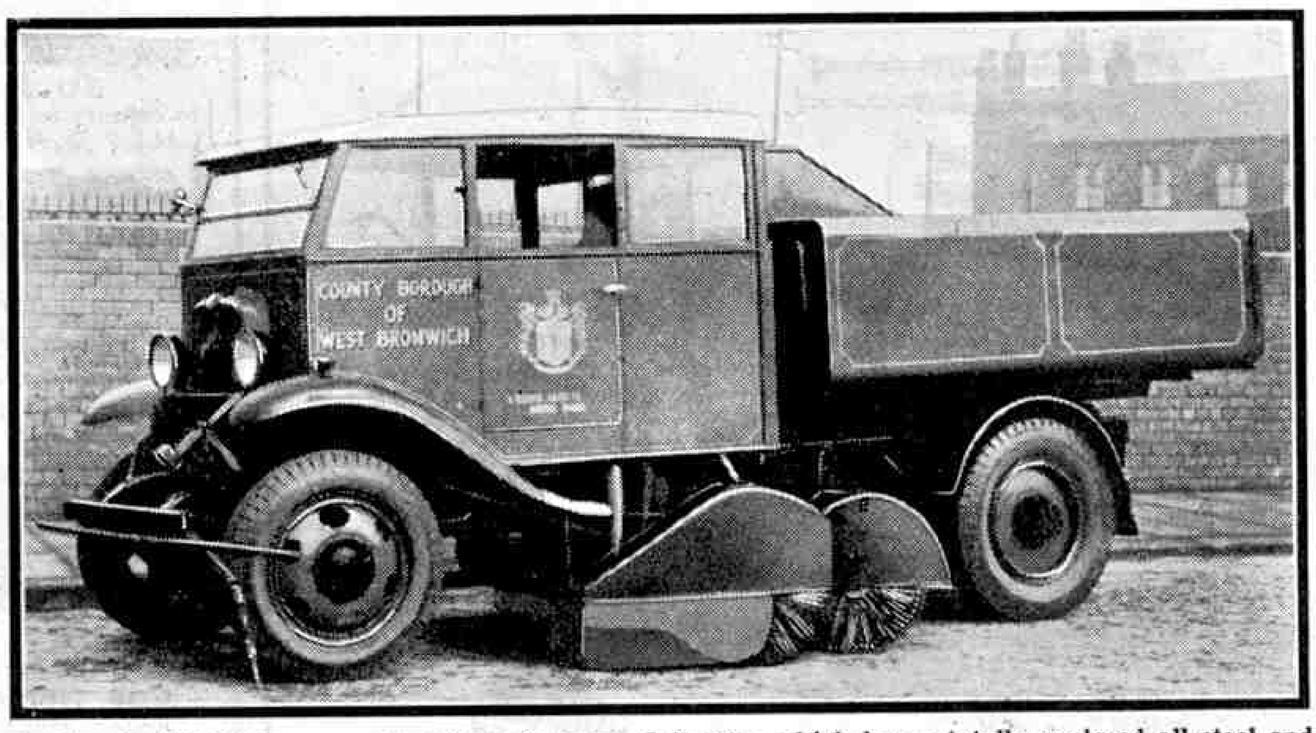
The Karrier range of municipal motor appliances also includes a three-wheeled road sweeper. This is known as the "Colt" sweeper. It has a single front wheel and a turning circle of only 21 ft., so that it is suitable for work in narrow streets. A four-cylinder engine of 14 h.p. is fitted in it, and from the gear box a separate drive is transmitted to a brush 7 ft. long that is set at an angle to sweep a track 6 ft. in width. The chassis carries a tank, of 180 gallons capacity, which is placed with its centre of gravity low over the back axle. This helps to make the vehicle stable. Water is pumped from the tank to a sprinkler pipe in front of the brush by means of a rotary pump, which is driven from the gear box.



The Karrier "RSC" Sweeper Collector, showing the casing of the centrifugal vertical conveyor that lifts sweepings into the side tipping body. At the rear is a water tank. Photograph by courtesy of Karrier Motors Ltd., Luton.

A collector that also is a huge vacuum cleaner is shown in the lower illustration on this page. It is made by Lewin Road Sweepers Limited. The sweeping and collecting apparatus is built upon a modified Bedford two-ton chassis of short wheelbase. It consists of a specially designed brush, with its mechanism totally enclosed, to which is attached a suction fan that carries dry dust into the side compartments of the body. This fan is used only in dry conditions, when dust is apt to blow about and to escape collection.

The brush of this collector is set square across the body and comprises eight sections, the outer ones being used in channels or gutters. It sweeps a track 7 ft. wide. The heavy sweepings are delivered into a conveyor that is in two sections, a horizontal one consisting of right and left hand spirals, and a vertical one that leads to the body of the truck, which usually takes the form of an enclosed container. The body is of steel and is constructed with four compartments. In the centre is one with a capacity of 60 cu. ft. into which the heavy sweepings are carried, and there is a compartment for water for sprinkling purposes in addition to the two side compartments for dust, each of which has a capacity of 20 cu. ft. The refuse is discharged by tipping the steel body by means of gear operated by hand.



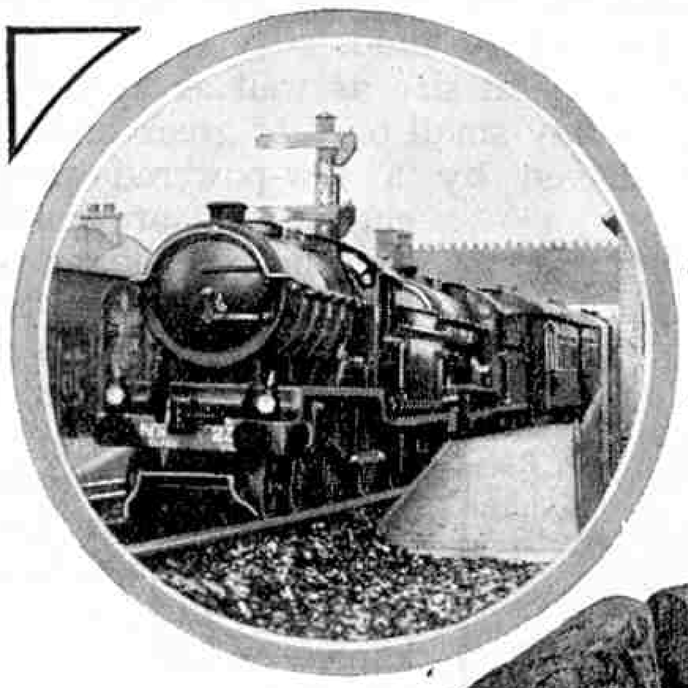
The Lewin "VSC" Vacuum Sprinkler Sweeper Collector, which has a totally enclosed all-steel end tipping body. Photograph by courtesy of Lewin Road Sweepers Ltd., Leeds.

Sweeper collectors vary in size as well as in design, and there are in use many small ones of great interest. These usually are driven by a low-powered petrol engine, and are guided by men walking behind and holding two handles, much as a motor lawn mower is controlled.

A hand controlled machine of this kind is made by Lewin Road Sweepers Ltd., and is known as the "Universal" Sweeper Collector. In shape it resembles a motor lawn mower, and it is provided with finger controls on the handles that are similar to those of a motor bicycle. The machine sweeps dust into a container, and can be used inside factories and in such places as tramcar and bus depots. It is also valuable for sweeping work in parks, and in street cleaning finds application in clearing pavements of dirt or snow. The brush is so mounted that it projects 3 in. to the left of the framework, and channels and the sides of gangways or paths alongside buildings therefore can be swept thoroughly. Another use is in following up mechanical and horse drawn machines that have already swept dirt into channels or gutters. Then it collects the sweepings and dumps them into heaps ready for removal.

The machine also can be arranged for sweeping without a container. Its brush is 16 in. in diameter and 3 ft. wide. It is driven by an air-cooled "Villiers" two-stroke 249 c.c. engine, which also propels the machine, and the working speed may be varied from 2 m.p.h. to 3½ m.p.h. The sweeper is well balanced, and can be moved about with great ease, and it is so sensitive in operation that if the operator holding the controls moves forward, stops or walks backwards the machine will do the same.

The drive is transmitted by a chain from the engine to the intermediate shaft through a plate clutch, and another chain carries it from the intermediate shaft to the axle, and its two cushion tyred rubber wheels. An idler rubber tyred wheel is fitted to the container to allow the brush to maintain a uniform surface pressure, and a watering apparatus for use in very dusty conditions or a blade to clear snow away can easily be fitted.



HORNBY

ELECT AN CLOCKW

ROLLING STOCK A

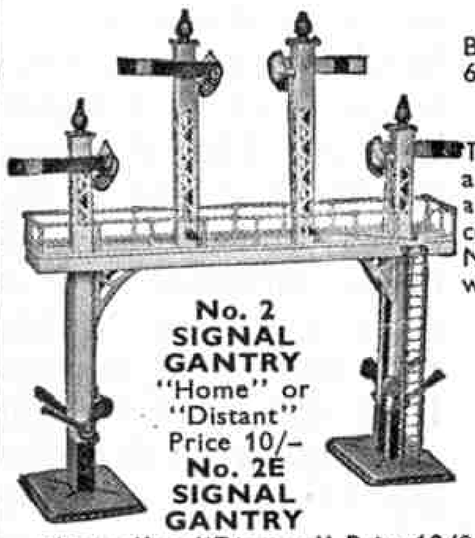
You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

Hornby Trains have always represented the latest model railway practice.

Two No. 1 and one No. 2 Cuttings are illustrated above.

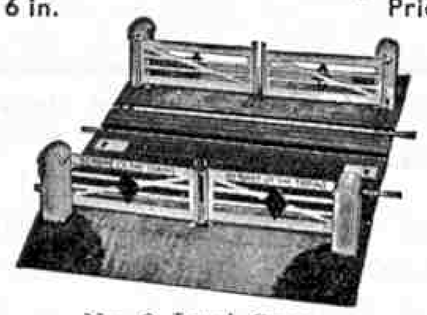
No. 1 CUTTING (END SECTION)
Base measurement: Length 7 11/16 in., width 6 in. Price, per pair 3/-

No. 2 CUTTING (CENTRE SECTION, STRAIGHT)
The addition of these Centre Sections enables a Hornby Railway Cutting to be extended to any length. They are intended to be used in conjunction with the End Sections (Cutting No. 1). Base measurement: Length 10¼ in., width 6 in. Price 2/-



No. 2 SIGNAL GANTRY
"Home" or "Distant"
Price 10/-

No. 2E SIGNAL GANTRY
"Home" or "Distant." Price 12/9

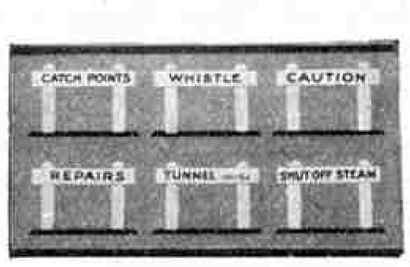


No. 2 Level Crossing

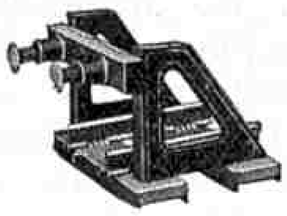
No. 2 LEVEL CROSSING
Measures 13½x10¼ in., with two gauge O tracks in position. Price 5/6

No. E2 LEVEL CROSSING (Electrical). Similar to Level Crossing No. 2, but fitted with two electrical tracks. Price 7/6

No. E2E LEVEL CROSSING
Similar to No. E2 Level Crossing but suitably fitted for electric lighting. Price 9/-

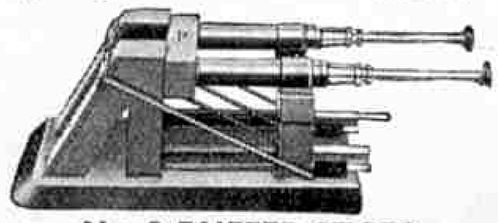


No. 8 RAILWAY ACCESSORIES
Notice Boards. Price 1/9



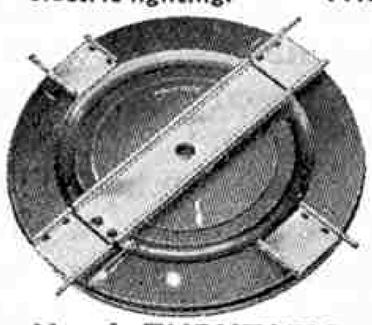
No. 1 BUFFER STOPS
(Spring type). Price 1/-

No. 1E BUFFER STOPS
as No. 1, but suitably fitted for electric lighting. Price 1/6



No. 2 BUFFER STOPS
(Hydraulic type). Price 5/6

No. 2E BUFFER STOPS
Similar to No. 2 Buffer Stops, but suitably fitted for electric lighting. Price 6/-



No. 1 TURNTABLE
(Illustrated). Price 2/6

No. 2 TURNTABLE
Price 3/9

No. E2 TURNTABLE (Electrical)
Similar to No. 2 Turntable, but fitted with electrical rails. Price 5/6

No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6 in.
Price 5/11

No. 2 STATION
Built up with three detachable sections. Named "Reading," "Wembley," "Ripon," or "Margate." Length 2 ft. 9 in., breadth 6 in., height 7 in. Price 8/-

STATION OR FIELD HOARDING
This realistic accessory is suitable for the station platform. Price 6d.

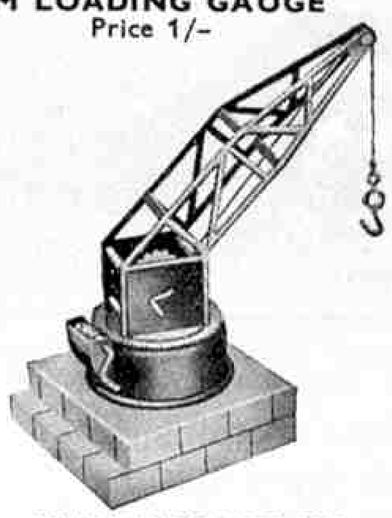
No. 4 Tunnel

No. 4 TUNNEL (CURVED)
Base measurement: Length 20 in. Width 9½ in. For 2 ft. radius track only. Price 4/9

PLATELAYER'S HUT
Price 1/-

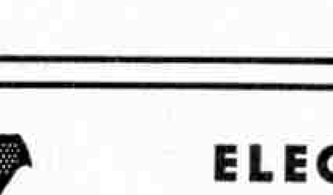
LOADING GAUGE
(Illustrated). Price 2/3

M LOADING GAUGE
Price 1/-



PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price 3/11

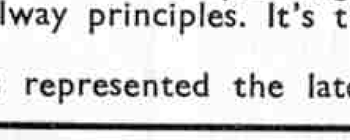
CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors. Price 2/9



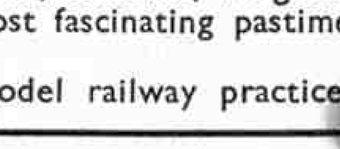
No. 1 LUMBER WAGON
Fitted with bolsters and stanchions. Price 1/6

***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Price 2/9

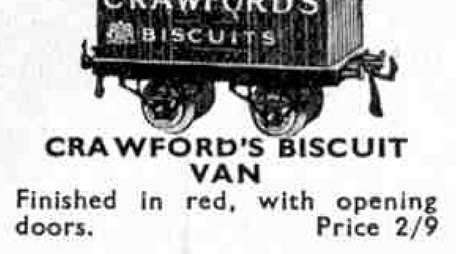
BARREL WAGON
An interesting model of a type of wagon used on Continental railways. Price 2/6



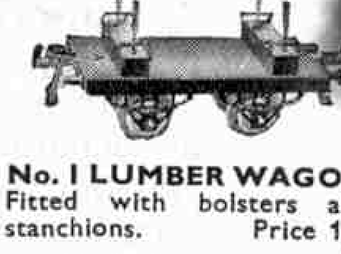
FIBRE WAGON
This is an interesting model of a type of wagon used in France and other Continental countries.
Price 1/3



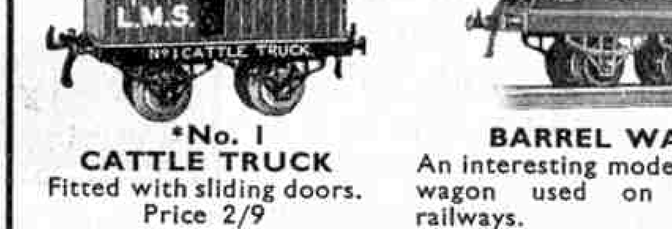
No. 1 BANANA VAN
An attractive model, finished in yellow and red. Price 2/9



GUARD'S VAN
In colours to represent L.M.S.R., L.N.E.R., G.W.R. or S.R. Price 2/6



CEMENT WAGON
The door at the top opens. Finished in red. Price 2/6

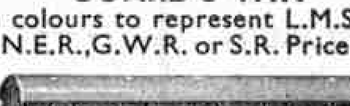


***COACH, No. 2 PASSENGER**
Suitable for 2 ft. radius rails only. First-third, or Brake-third. Price 7/6

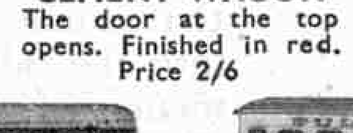
COACH, No. 3
Price 1/

No. 1 SIDE TIPPING WAGON
"Robert Hudson Ltd., Leeds."
Price 2/-

WINE WAGON DOUBLE BARREL
Price 4/6



MO PETROL TANK WAGON "SHELL MEX"
Finished in cream with lettering in black. Price 1/-



MO SIDE TIPPING WAGON
Finished in bright yellow and tips either side. Price 1/-

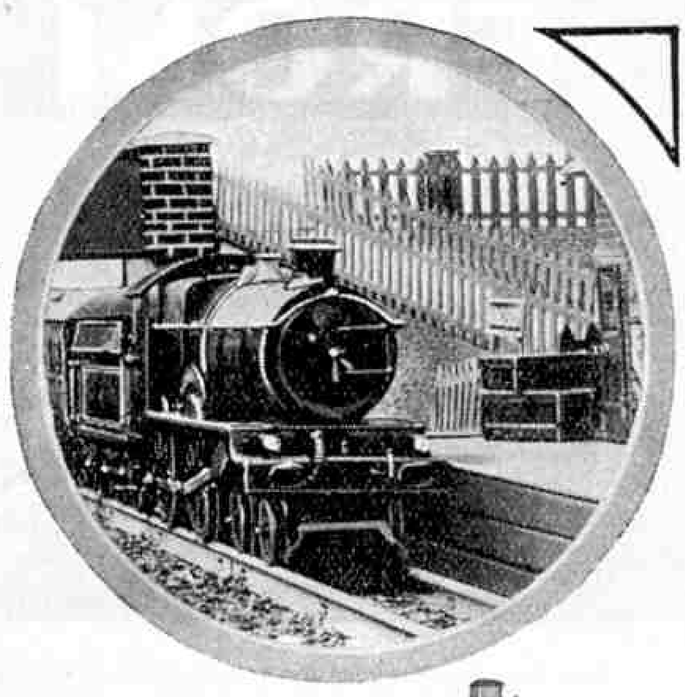
* *In L.M.S., N.E., G.W*

MECCANO LIMITED, BINN

CTRIC
ND
KWORK

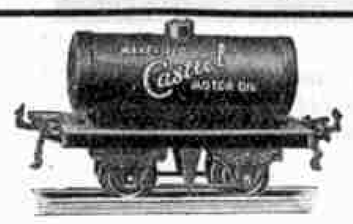
TRAINS

AND ACCESSORIES

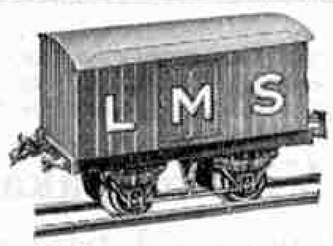


Designs are continually being improved and new items added so that the system is complete in practically every detail.

A selection of items from the splendid range of Rolling Stock and Accessories is shown below. Take Dad with you to your dealer's to-day to see these and all the others available—they must be seen to be appreciated.



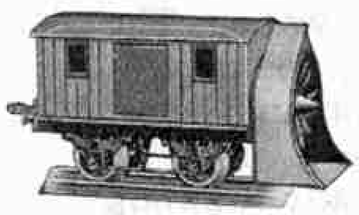
OIL TANK WAGON "CASTROL"
Enamelled green with lettering in red. Price 2/-



***No. 1 LUGGAGE VAN**
With opening doors. Price 2/9

BITUMEN TANK WAGON "COLAS"
Finished in blue. Price 3/6

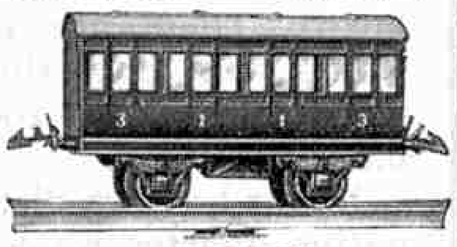
***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price 3/6



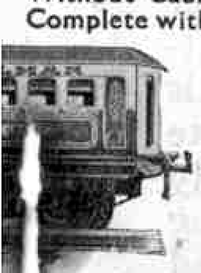
SNOW PLOUGH
With revolving plough. Price 3/9

BRAKE VAN
Finished in brown, with opening doors. Obtainable in N.E. or S.R. lettering. Price 2/11

***FLAT TRUCK**
Without Cable Drum. Price 1/6
Complete with Cable Drum ,, 1/9

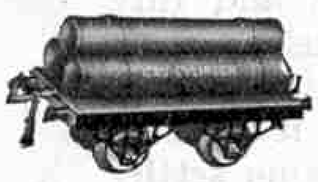


***COACH**
No. 1 PASSENGER
Price 2/6

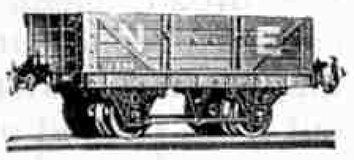


D PULLMAN
ice 1/3

COACH, No. 2 SPECIAL PULLMAN
Suitable for 2 ft. radius rails only. Price 13/-



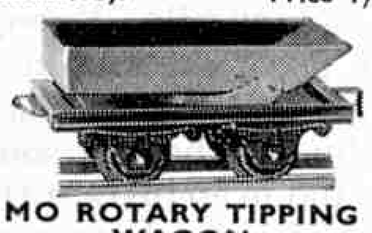
GAS CYLINDER WAGON
Finished in blue and red, lettered gold. Price 1/11



***No. O WAGON, HORNBY**
Price 1/6

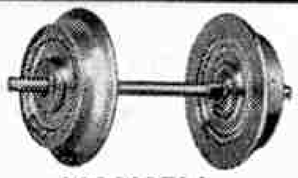
***No. 1 WAGON, HORNBY**
(Illustrated). Price 1/9

No. 1 CRANE TRUCK
Finished in gold and blue. The Crane revolves on its base. Price 2/11



MO ROTARY TIPPING WAGON
Finished in green. Container revolves and tips at any angle. Price 1/-

G.W. or S.R. lettering.



MANSELL WHEELS
These solid die-cast Wheels can be fitted to Hornby Coaches, Vans, etc.
Price per pair 3d.

DIE-CAST SPOKED WHEELS
As fitted to Hornby Tenders, and for Wagons etc.
Price per pair 3d.

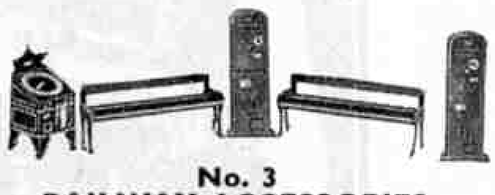
No. 1A FOOTBRIDGE
Complete with Signals. Price 4/6

No. 1 FOOTBRIDGE. Without Signals. Price 2/11

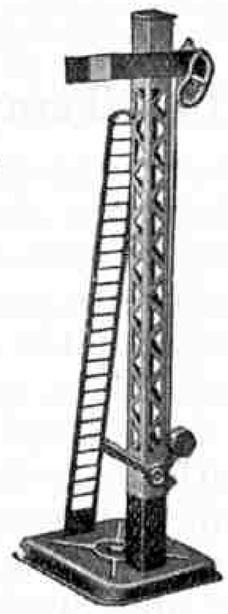
No. 1 RAILWAY ACCESSORIES
Miniature Luggage and Truck. Price 1/-

No. 1 SIGNAL CABIN
Price 2/6

No. 2 RAILWAY ACCESSORIES
Milk Cans and Truck. Price 1/3

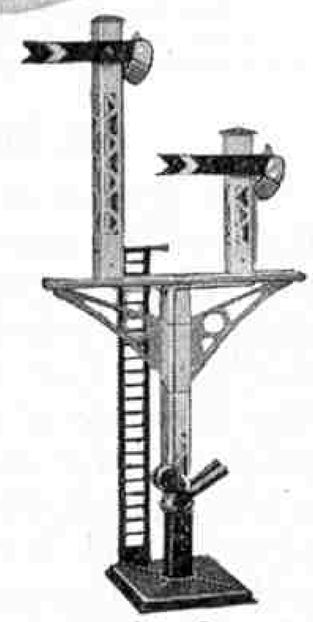


No. 3 RAILWAY ACCESSORIES
Platform Machines. etc. Price 1/6



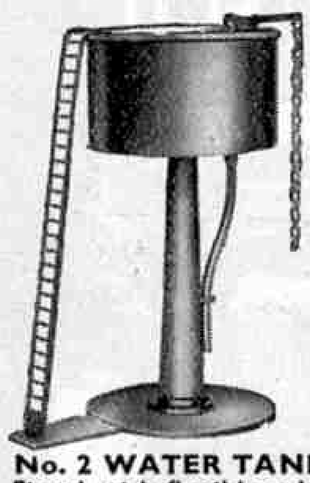
No. 2 SIGNAL
"Home" or "Distant." Price 2/-

No. 2E SIGNAL
Similar to No. 2 Signal, but suitably wired for electric lighting. Price 2/9



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Price 4/9

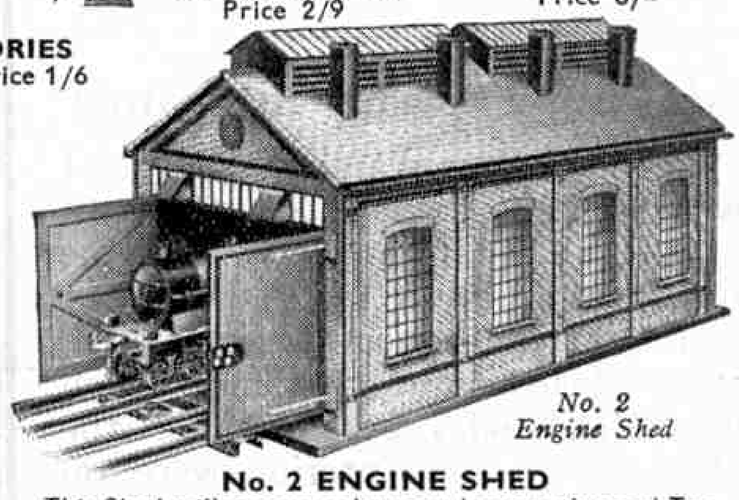
No. 2E JUNCTION SIGNAL
Similar to No. 2 Junction Signal, but suitably wired for electric lighting. Price 6/-



No. 2 WATER TANK
Fitted with flexible tube and valve lever. Stands 8½ in. high. Price 5/9

No. 2E WATER TANK
Similar to No. 2 Water Tank, but suitably fitted for electric lighting. Price 6/6

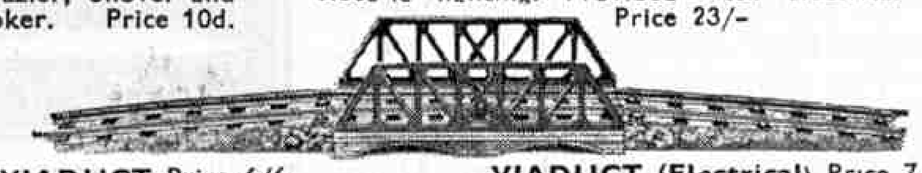
No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price 10d.



No. 2 Engine Shed

No. 2 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 17½ in. Price 22/6

No. E2E ENGINE SHED
Similar to No. 2 Engine Shed but suitably fitted for electric lighting. Provided with electrical track. Price 23/-



VIADUCT Price 6/6 **VIADUCT (Electrical)** Price 7/6
VIADUCT Centre Section only ... ... ,, 4/-
VIADUCT (Electrical) Centre Section only ... ... ,, 4/6

M STATION SET (7 pieces) Price 3/-
The components of the M Station Set can be purchased separately as follows: M Signal Box. Price 4d.
M Signals. Price 4d. M Station. Price 1/-
M Telegraph Pole No. 1. Price 3d. M Wayside Station. Price 9d.

NNS ROAD, LIVERPOOL 13.

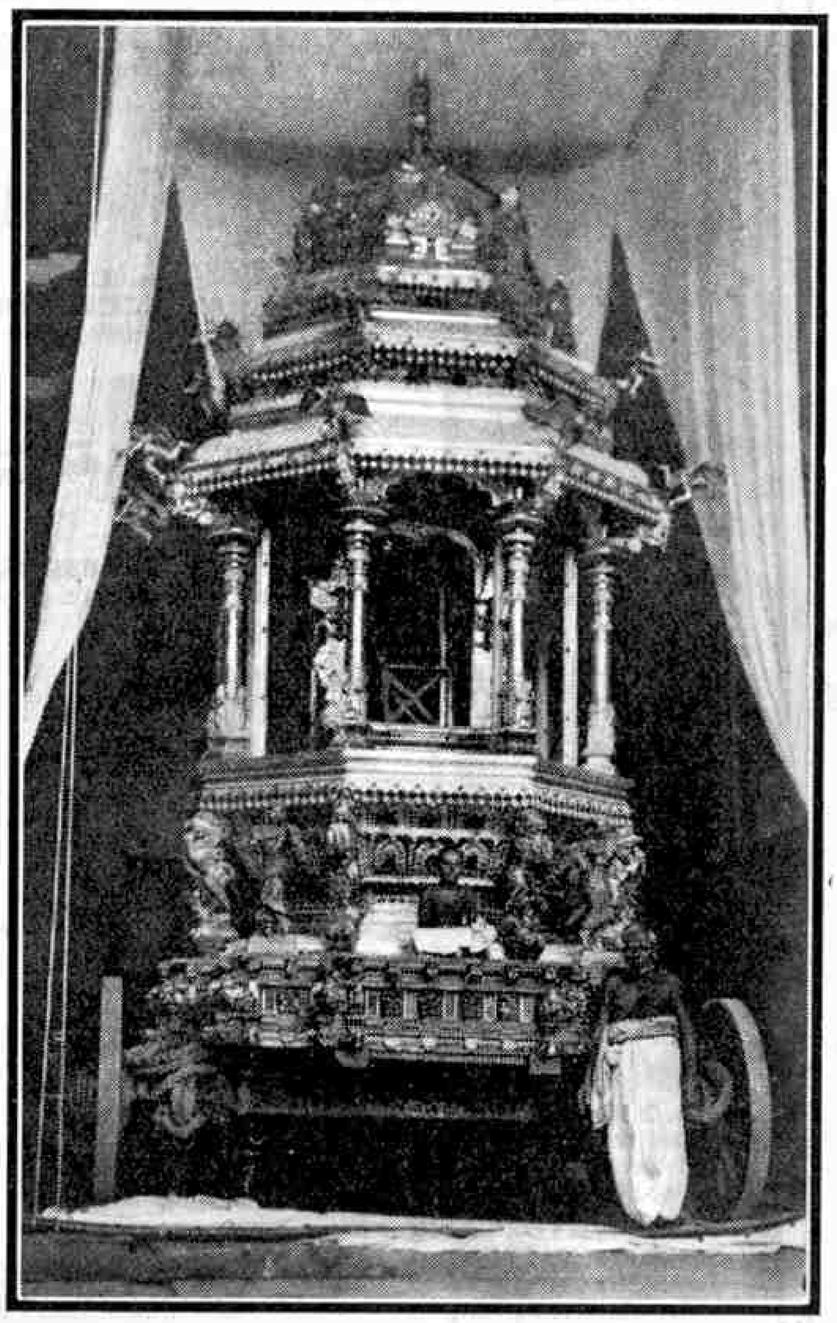
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

An Indian Temple's Treasure

The Temple of Rameswaram, in the Madras Presidency, is one of the most beautiful and picturesque in India. It is a stately structure, in which there are many valuable objects and jewels, but its most remarkable possession is the "Silver Car" shown in the accompanying photograph. This is made of pure silver, and its enormous size can be realised when it is compared with the man standing by the wheel. It runs on four wheels, and its appearance gives some idea of the splendour and wealth of the temple.

During Sivaratram, or the festival of fasting in honour of the god Siva, the god of the Temple is placed on the car, which is then pulled through the streets by the people.

P. N. Roy (Calcutta).



The silver car of the Temple of Rameswaram in the Madras Presidency. Photograph by P. N. Roy, Calcutta.

Making Tapestry in France

While in Beauvais, in France, I was one of a party who were shown how the tapestries for which the town is famous are made. Upon our arrival at the factory we inspected, the guide led us into a room in which beautiful chairs prepared for the Ministry of the Interior were on view, and afterwards we were shown many paintings, all of which had been used as subjects for tapestries. Then we went into the room where the tapestries actually were being made. The looms employed are from three to four feet high. Thin strands of wool run up and down their frames, and the weavers have reels of silk which they pull in and out through the strands of wool, thus forming patterns. There are 10,000 different shades of silk in use, and the reels are kept in glass cases placed round the room.

Above the looms are hung the pictures that the weavers are copying. Black-and-white drawings of the pictures also are suspended underneath the wool, so that it is easier for the weavers to retain the correct proportions in their pieces of tapestry. Two experts working at a piece of tapestry measuring two feet by three feet take about three years to complete it. R. P. Letcher (Ringwood).

A Visit to Dakar

While on a recent voyage I paid a visit to Dakar, a French town in Senegal, and the most westerly town in Africa. There is a fine natural harbour, but ships entering it must cast anchor, for the wharf can accommodate only the smallest vessels.

No sooner were we inside the harbour than our ship was surrounded by craft of every description, some carrying natives selling curios, others laden with youths who dived for money thrown into the water. The noise was unbelievable, and to add to the general pandemonium the air above was black with a flock of screeching sea eagles, ready to swoop down and snap up any scrap of refuse that should be thrown overboard. There are no seagulls in Dakar, but only these sea eagles, which live in the rocky cliffs that flank the coast.

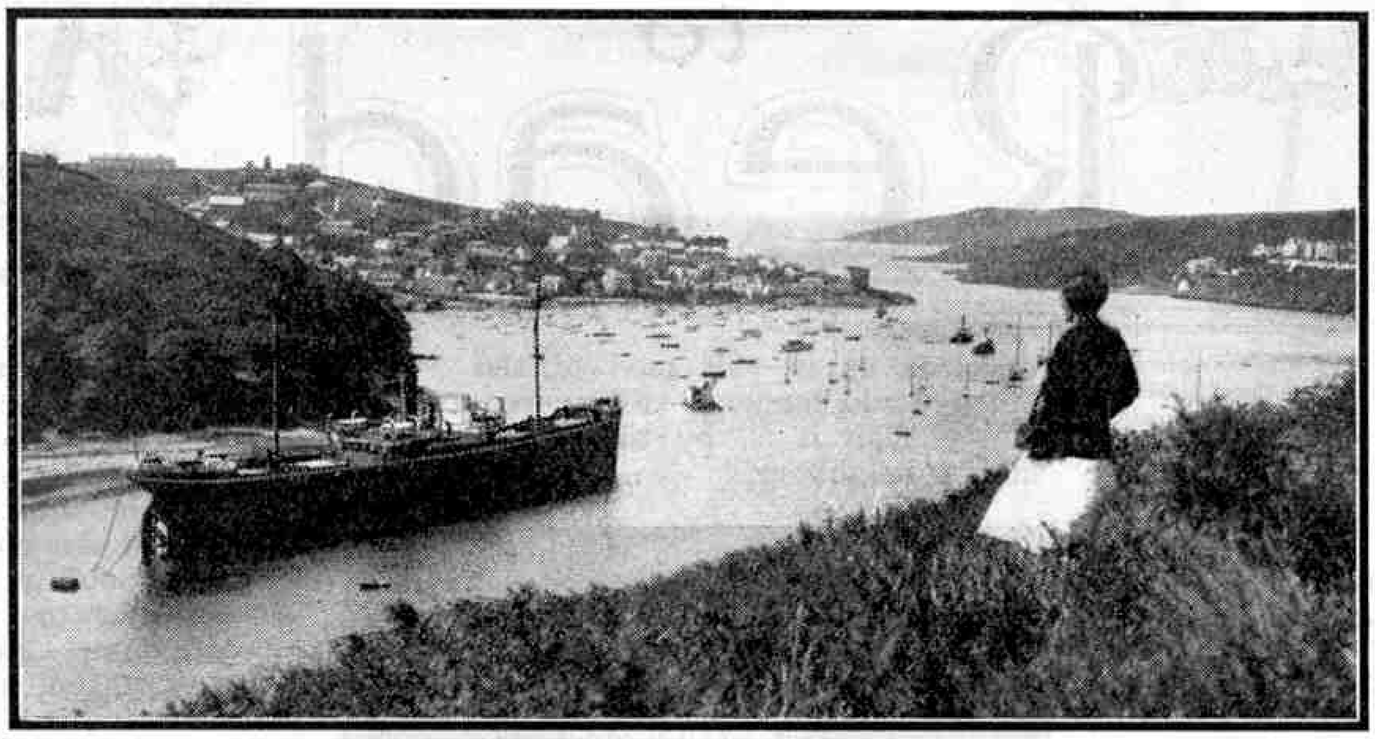
Dakar has two distinct parts; the native quarter round the harbour, and the new town built on higher ground, where the few white inhabitants, mainly Government officials and police, have formed a separate colony. The old town is typically oriental, with narrow winding cobbled streets, untidy houses, and innumerable cafes. The new town has broad, clean streets and tidy comfortable-looking houses, with magnificent gardens, and is so different from the old one that it scarcely seems to be part of the same settlement.

A curious feature of the town is that everyone carries an umbrella. We wondered at this at first, but were soon to learn the reason. About half way through the afternoon there was a terrific peal of thunder, followed by a dead calm. At the first sound everyone ran for the nearest shelter, and in an instant the streets became deserted. The calm lasted only about a minute, and then began a torrent of rain that fell with a noise like that of a distant waterfall. The streets became miniature rivers, and the ear-splitting peals of thunder continued. Suddenly all was over. The rain ceased, the clouds melted away, and the rivers became streets again. M. C. Lupton (St. Andrews).

The Picturesque Port of Fowey

Fowey, or "Foy" as it is pronounced, is one of the most fascinating towns in Cornwall, with its narrow tortuous streets and beautiful harbour and river. It was the happy hunting ground of "Sea Rat," one of the characters in Kenneth Grahame's well-known book *"The Wind in the Willows."*

Fowey Harbour is at the mouth of a picturesque inlet between imposing headlands, which extends inland for six miles to Lostwithiel. The harbour itself is nearly four miles long, and vessels with a draught of up to 30 ft. can enter on the tide.



Looking seaward across Fowey Harbour, in Cornwall. The greater part of the Cornish output of china clay is shipped from this port. Photograph by Miss I. Marsh, Burnham-on-Sea.

Most of Cornwall's output of china clay is shipped from the eight jetties in the harbour, the mechanical equipment of which is designed to deal with 1,500,000 tons of clay a year. Three of the jetties have electric belt conveyors, each capable of delivering clay into the holds of a ship at the rate of 240 tons an hour; and an ingenious system of conveyors and a travelling tower enables a vessel to be loaded through all hatchways in turn without being moved. The clay goes to many countries overseas, some of it as far as Japan. Miss I. MARSH (Burnham-on-Sea).

In the Engine-room of the *"Bremen"*

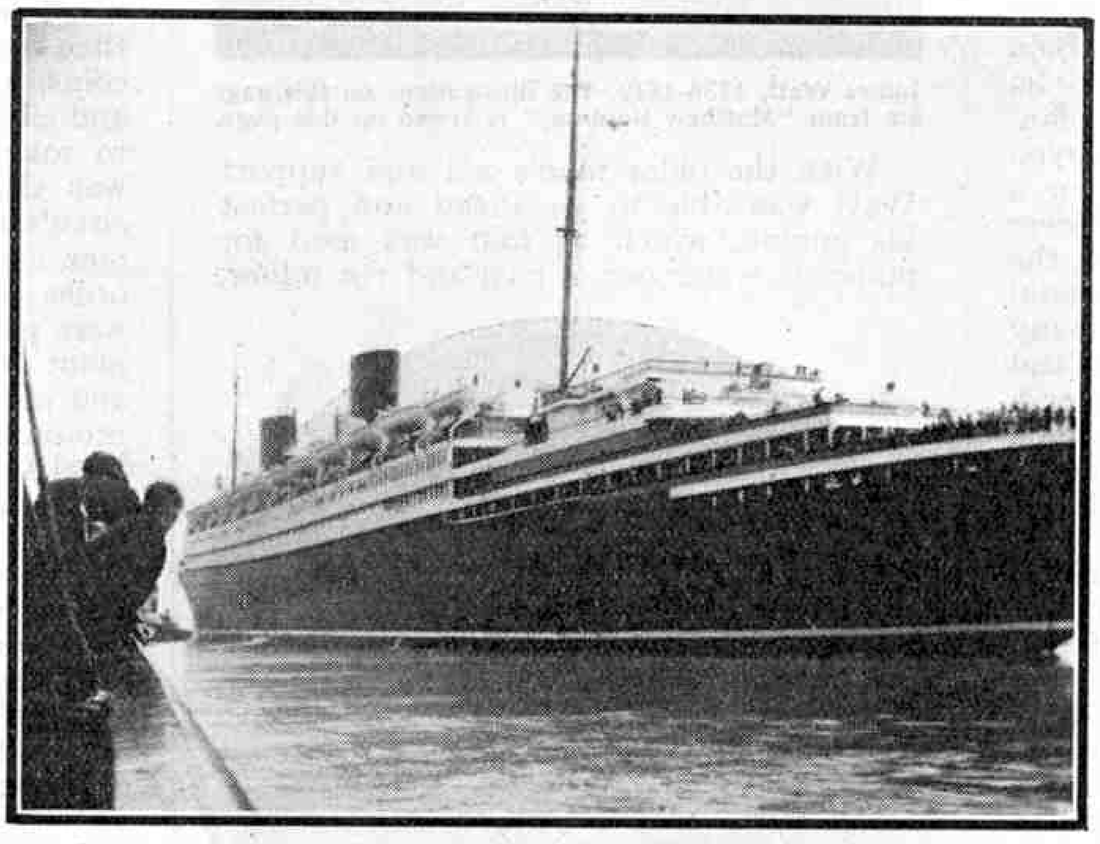
Recently I went from Southampton to Bremerhaven on the Norddeutscher Lloyd liner *"Bremen,"* the vessel that in 1929 won the Blue Riband of the Atlantic from the *"Mauretania."* During the voyage I paid a visit to the engine-room, going below down long steel ladders. There the great single-reduction turbines, clean and well polished, were humming gently as the huge ship ploughed through the water at 25 knots. I then saw the condensers for turning the steam back into water, with the large pumps that form part of their equipment.

After passing through the engine-room I was conducted to the boiler-rooms. There also everything was exceptionally clean, but it was very warm. The ship's engines are supplied with steam from a battery of oil-fired water-tube boilers, and the furnaces require very few men to tend them.

Beyond the boiler-rooms are the auxiliary engines for supplying power and light for the ship, and I noticed particularly the large switchboards, from which cables lead all over the ship. Finally I was taken to the shaft tunnel, where are the large propeller shafts, each about two feet in diameter and firmly held in giant bearings. This tunnel extends nearly half the length of the vessel.

The German engineer who conducted me round was very courteous, and explained everything I saw in good English, so making the visit a very enjoyable experience.

S. A. J. PARSONS (Carshalton).



The German liner "Bremen." Photograph by S. A. J. Parsons, Carshalton.

The Toheroa of New Zealand

A short time ago I traversed with a friend Ninety Mile Beach, in the North Island of New Zealand, while on a bicycle tour. We discovered an encampment of about 300 Maoris in the sandhills skirting the beach, and these hospitable people invited us into one of their "whares" and made tea for us. They were digging and shelling toheroas, shell fish for which Ninety Mile Beach is famous, for a large canning firm. We sampled the fish raw, from the shell, and cooked. When roasted on the shell it is very leathery, and our efforts to chew it evoked some amusement. We had an easier task when offered a raw one, which we forced ourselves to swallow, as we did not wish to hurt the feelings of our kind hosts. This is not the usual way to eat toheroas, however. They are usually minced and made into fritters.

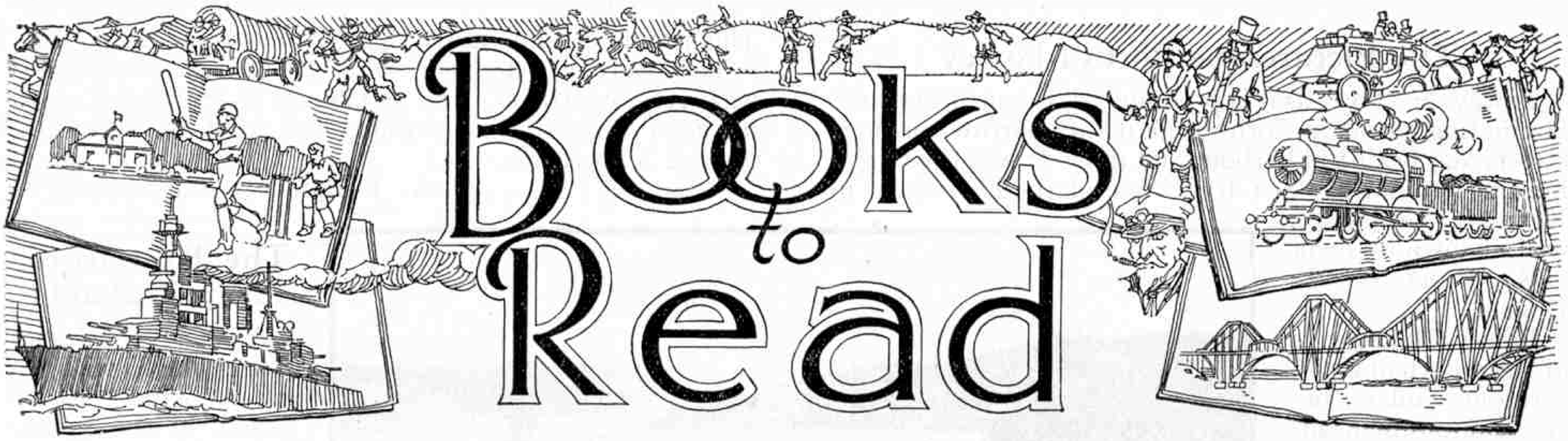
The toheroas are dug from the sand at low tide. As each wave recedes small airholes on the wet sand show the position of the shell-fish. These burrow about nine inches below the surface, and feed through a syphon reaching up into the water above. The Maoris dig them out with pitchforks.

A. AUSTIN (Auckland, N.Z.).

Daunt's Rock Lightship

The Daunt's Rock Lightship is situated about five miles from Cork Harbour. A short time ago I went out in the relief boat and looked round this vessel, the most important part of which is the room where the controls for the light and detonators are fitted. The lantern is rotated by a powerful clockwork motor that has to be rewound every 20 minutes. The detonators are loaded on carriers, two at a time, and then swung out from the cabin. While those on the port carrier are being fired, the starboard carrier is being loaded.

I then climbed an almost vertical ladder to the lantern. I stood up inside this, and was then surrounded by the complicated lens systems that project the beam to a distance of 20 miles. The lamp burns oil, which is pumped up from a tank below. Before leaving I saw the huge chains that anchor the ship. K. PEARD (Dublin).



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/- for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

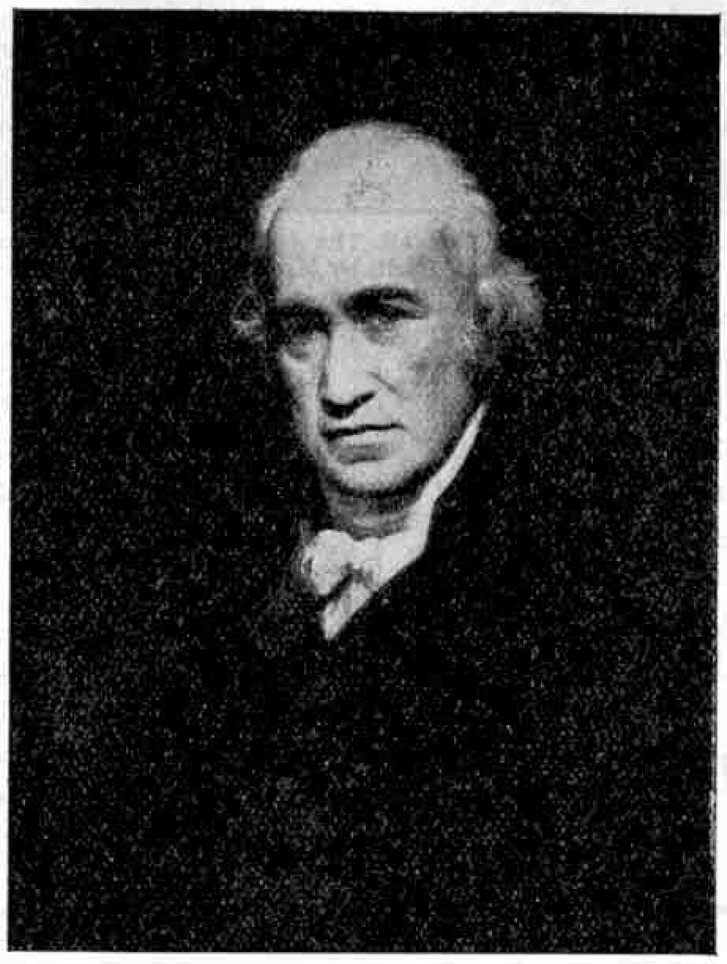
"Matthew Boulton"

By H. W. Dickinson
(Cambridge University Press. 10/6 net)

The name of Matthew Boulton is inseparably connected with that of James Watt, the great inventor to whom we owe the modern steam engine. His career is of great interest apart from his association with Watt, however, for he was the most prominent citizen of Birmingham during the 18th century. He developed new industries and enlarged old ones, and a record of his life, such as that now given by Mr. Dickinson, will interest all who wish to know something of the rise of modern industry, and particularly of the application to it of power.

Boulton was born on 14th September, 1728, at Birmingham, and at the age of 17 entered his father's business, which was that of toy-making. In those days toy-making meant something very different from what it does to-day, and Boulton was chiefly occupied in the production of buckles. He soon became a successful manufacturer, and he was only 34 when he built a new works, known as the Soho Manufactory, on an entirely new plan. Until that time a master usually employed only a few men and housed them in a small building, where all operations were carried out by hand, or perhaps with the aid of the horse mill, a crude and wasteful form of power. In Boulton's factory many workmen of the different hardware and toy trades were brought together under a single management, as in modern works, and water power was available. In summer the stream that supplied power to Boulton's works proved insufficient, however, and the enterprising owner began to think of using steam power. It was at this time that he heard of James Watt, and of the wonderful improvement the latter had effected in the crude steam engines then in use by his great invention of the separate condenser.

Watt suffered many disappointments in his efforts to develop his invention, but at length Boulton acquired an interest in his engine and the great partnership began. This was more than a partnership, for Boulton had taken a great liking to Watt. Long before the two became closely associated, Boulton had written to Watt to tell him "nothing will alter my inclinations for being concerned with you, or for rendering you all the service in my power and although there seem to be some obstruction to our partnership in the engine trade, yet I live in hope that you or I may hit upon some scheme or other that may associate us in this part of the world, which would render it still more agreeable to me than it is, by the acquisition of such a neighbour."



James Watt, 1736-1819. The illustrations on this page are from "Matthew Boulton," reviewed on this page.

With the older man's aid and support Watt was able to go ahead and perfect his engine, which at first was used for pumping water out of coal and tin mines.

Boulton Memorial Medal, issued in 1819, showing a portrait of Boulton on the obverse side.

The author makes it clear from letters that Boulton urged his friend to make it turn wheels, so that it could be used for driving machinery. He made the brilliant suggestion that engine sizes and parts should be systemised to make production cheaper and so to secure a large output. With this encouragement Watt entered upon the most productive period of his life, and the credit of spurring him on is due to Boulton. The latter also contributed something on the technical side of the partnership. He had already introduced many ingenious devices into his own business, and he invented a syphon pressure gauge for Watt's engine and suggested the use of blacklead dust for lubricating the piston. A further valuable suggestion was that of boilers with iron or copper fire tubes in them, and a hint from him of a device he saw in a large flour mill near Blackfriars Bridge, London, for which engines were made by Boulton and Watt, led to the invention by Watt of the centrifugal governor.

Boulton's association with Watt did not by any means represent the whole of his activities, a full record of which is given in the book. We read of his manufacture of Sheffield plate, a side of his work that brought him into contact with George III and his Queen, to whom he sold many magnificent candlesticks, vases and other pieces. Later he turned his attention to coining money. The Royal Mint could not then keep pace with the growing demand for coins, and confined its operations to gold and silver, so that tradesmen had to resort to tokens for copper coinage. The result was that half the copper coins then in circulation were counterfeit, and business men carried pocket balances with them in order to test the coins with which they were paid for their goods. Boulton devised plant driven by means of the steam engine, and eventually secured a contract for the production of copper coins for use in England and Ireland, and for the supply of coinage elsewhere.

With all these activities Boulton's and Watt's business grew to such an extent that it was necessary to build an entirely new works for the manufacture of engines and similar work. Boulton lived to see the wonderful success of the new venture and almost to the end of his life remained full of energy and ingenuity, for his works, and particularly his Mint, were his hobby. He died on 17th August, 1809.

Apart altogether from Boulton's wonderful sagacity and foresight in business, he was looked up to because of his generosity and his friendliness with his workmen, among whom he lived "like the Chieftain of his tribe," as Boswell, the biographer of Dr. Johnson, said after visiting the Soho Manufactory.

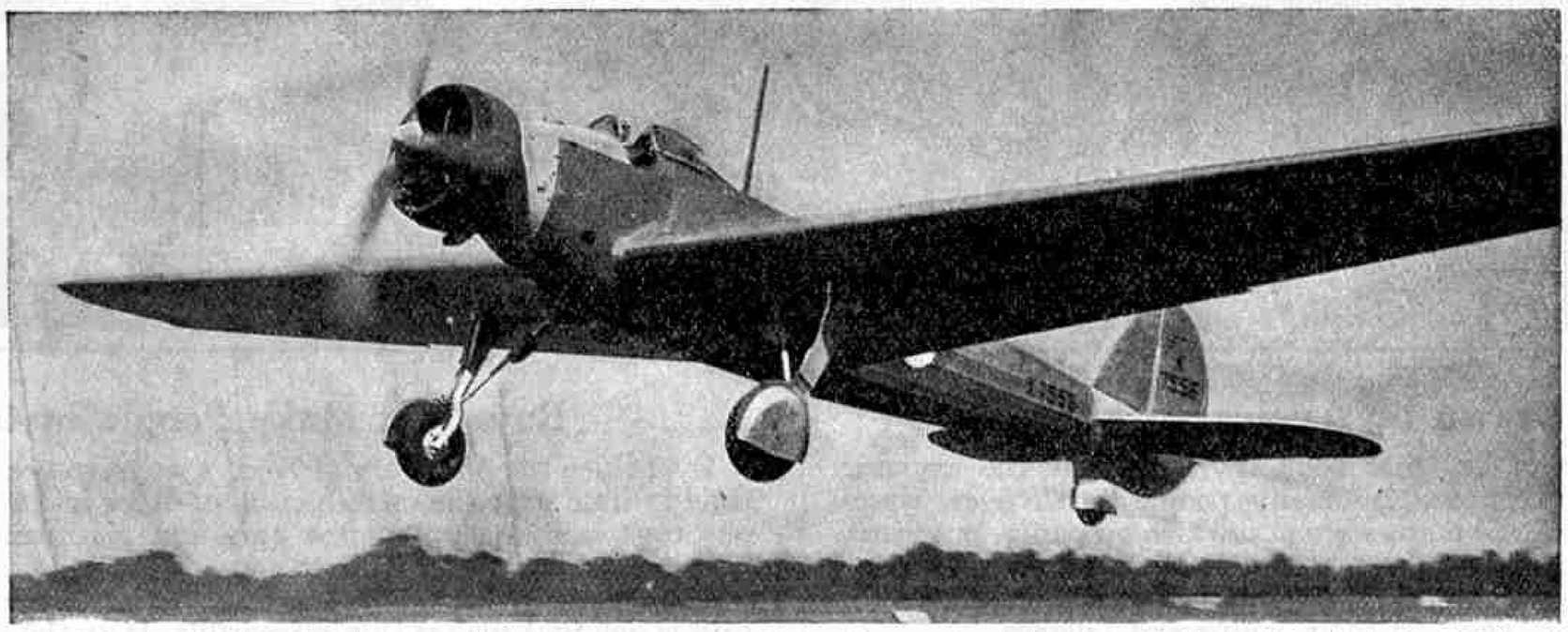
The book is illustrated by a frontispiece and 14 plates, showing views of Boulton's works and of interesting and artistic products, including coins and medals from the Soho Mint.

"Boys' Book of Flying"

By CHARLES BOFF. (Routledge. 6/- net)

This book has been specially written to satisfy the growing demand on the part of boys for accurate information about flying, combined with interest and entertainment. It is concerned almost entirely with the many and varied aspects of present-day air activities, and the aircraft described range from the diminutive "Flying Flea" and the latest Autogiros to giant flying boats of both civil and military types. The work of the R.A.F. and of the Fleet Air Arm is dealt with in an interesting manner, and there is an excellent description of how Squadron Leader Swain regained the world altitude record for Britain last year.

Gliding, parachuting, air racing, and exploring the stratosphere are other aspects of aviation referred to, and the hazards of night flying on commercial air routes are vividly described. The concluding chapter is a brief survey of the history of aviation. The book is illustrated by many excellent full-page plates showing modern aeroplanes.



The Vickers "Wellesley" two-seater all-metal long range bomber and general purpose aircraft. From "Boys' Book of Flying," reviewed on this page.

"Sands, Clays and Minerals"

Edited by A. L. CURTIS. (Vol. 3. No. 1. 3/6)

The present issue of this valuable magazine contains 76 pages of larger size than those of previous numbers. Its contents continue to be of high quality, and illustrations on an even more copious scale than formerly add to their value.

Many of the contributions to this issue are technical in character, as is to be expected in a magazine of this kind, but there are others that will attract the general reader. These include articles on the nickel industry in Canada and on mining in Tanganyika Territory, each written by an authority. In the former the steps by which Canada has become the world's greatest source of nickel are described; and the article on mining for gold and other minerals in Tanganyika reveals interesting facts about this East African territory, which as yet is largely undeveloped.

Other articles in this issue deal with such interesting topics as the chemistry of soils, industrial water supplies, and the use of precious metals in decorating pottery and glass. A feature of special interest is an editorial article dealing with the mineral resources of the British Empire. The policy of this magazine is to encourage the development of these in order to make the Empire self-contained, and various schemes for accomplishing this are discussed.

"Everyday Science"

By A. W. HASLETT. (Bell and Sons. 7/6 net)

Very few people realise to what a remarkable extent our daily lives depend on science, and still fewer understand the ideas behind the products of the scientist of which we make constant use. Mr. Haslett's book is intended to explain these ideas and to present science at home, in the widest sense. He begins with the story of new ways in our houses, where the coming of gas and electricity has revolutionised lighting, heating and cooking, as well as cleaning and washing operations generally. We have not yet reached the limit of what science can do for us there, however, and the author foreshadows further interesting developments, including better refrigeration and air conditioning.

Labour-saving inside and outside the home, improvements in building materials and the manner in which they are used, and the fight against criminals are then dealt with, after which follows a very interesting section, entitled *"Farmer Versus Nature,"* in which the host of problems that confront agriculture as a result of Man's efforts to upset Nature's balance to his own advantage are considered.

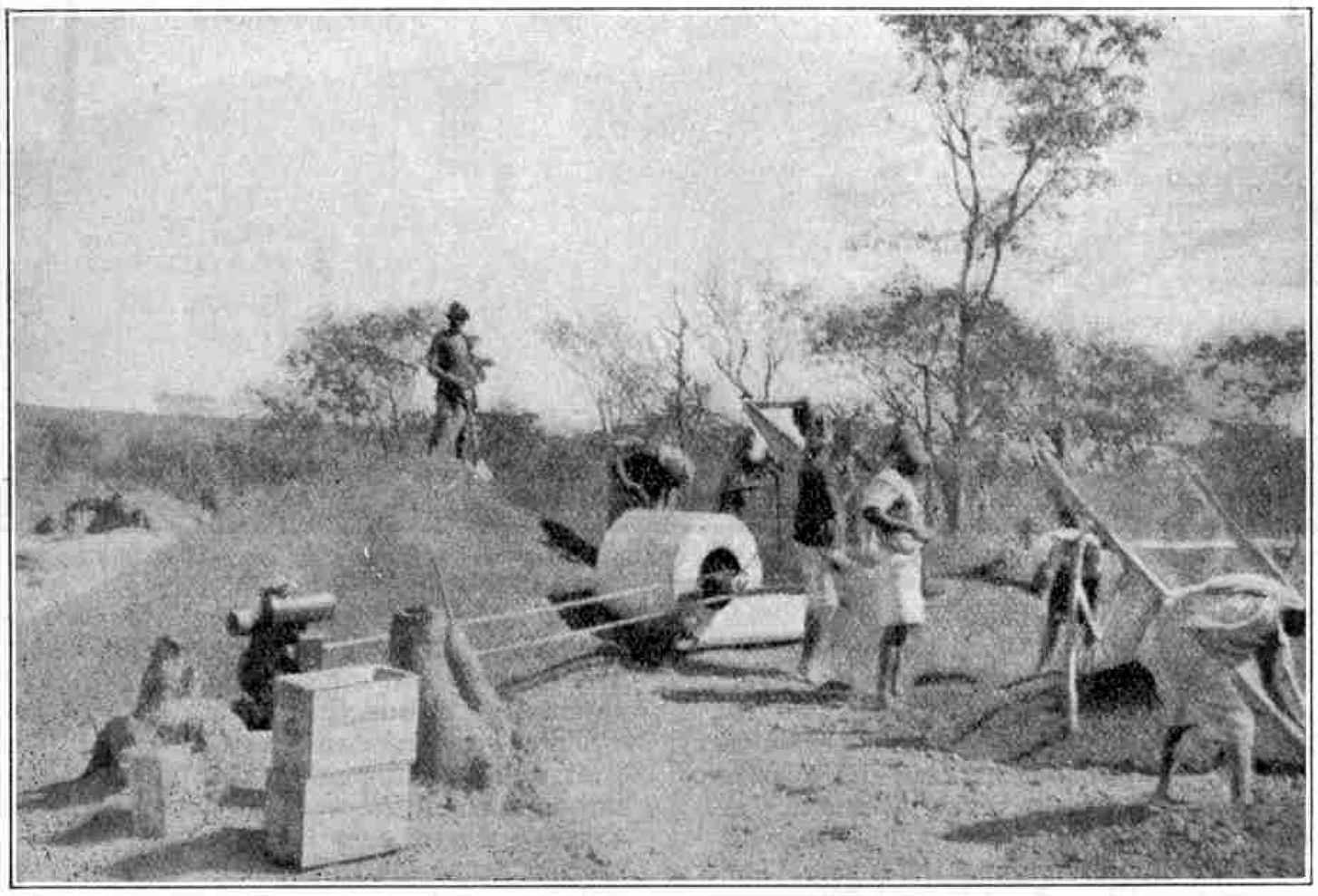
The story of deficiencies in our daily diet and the fight against disease then follows, and this leads to the problem of our inability to make full use of the riches with which Nature presents us. The facts that Mr. Haslett gives about waste will astonish many of his readers, for few suspect that an all-round efficiency of only 40 per cent. is probably the best that can be hoped for from any engine. The last chapter deals with speed, explaining how successive developments have speeded up life in general, with examples of records on land and sea, and in the air, to illustrate the story.

"The Secret of Keeping Fit"

By ARTIE MCGOVERN (Harrap. 5/- net)

Mr. McGovern has been America's best known instructor in physical culture for 25 years, and his system has been followed by such famous athletes as Babe Ruth, Jack Dempsey and Gene Sarazen, and by thousands of ordinary people. Now the secrets of his way to better health are made public in a book that will be read with the greatest interest by young and old alike, all of whom are sure to derive benefit from its sound advice and to enjoy its entertaining manner.

The book is as valuable as an entire gymnasium course. The author goes thoroughly into such matters as diet and the building up of muscle. He gives excellent advice on posture and the care of the body generally, and his admonitions are brightened by his stories of the successes he has achieved with famous people in many different walks of life. Finally he describes a series of 27 exercises that, in his own expressive phrase, "take all your muscles for a walk." Many readers will be surprised to find that these exercises must be taken lying down, for the author believes that this conserves energy and develops better muscle tone. The exercises are fully explained with the aid of large clear drawings.



A power-driven dry blower at work on the Lupa Goldfield, Tanganyika Territory. From the issue of "Sands, Clays and Minerals" reviewed on this page.

"The Course of Study for Cadets at Sea"

(Brown, Son and Ferguson Ltd. 2/- net)

The course outlined in this book is designed to encourage cadets to study while at sea by providing them with a definite four-year scheme. This is based on the syllabus of the Central Board for the Training of Officers, which is similar to the Board of Trade syllabus for Second Mates' Examination, but includes engineering knowledge. A selection of text books is followed by question papers arranged progressively in sets, each representing work for a six months' voyage.

Maps Drawn by Ancient Britons

The astonishing fact has just been revealed that the ancient Britons, mistakenly regarded by many people as savages, were expert map drawers! Their maps were not drawn on paper, but were marked out on the ground; and some of these have been discovered on heights in Northumberland, where the people of more than 2,000 years ago had their camps and villages.

The maps so far recognised have been discovered on flat stone surfaces. These were seen to be grooved, and the ancient maps were revealed when the grooves were outlined with chalk in order to make their courses more prominent. Concentric circles show the positions of camps or villages, the importance and size of each place being indicated by the number of circles in the group representing it; and lines mark the tracks connecting the settlements.

The maps are surprisingly accurate, and the sites of previously unknown stone circles, or temples, and of ancient trackways, actually have been found from a study of them, although they had been completely obscured or covered with earth for two thousand years or more. No more striking evidence could be given of the high degree of civilisation attained by the Britons before the coming of the Romans than the existence of these strange rock-carved maps.

A Roman Pottery Kiln

We have to depend largely on excavation for evidence of the life and work of the country when the Romans took possession of it, and introduced many of their own arts. Striking discoveries are made from time to time, and one of the most interesting of recent years was a pottery kiln crudely constructed of clay that was discovered in the middle of a ploughed field in Berkshire. The kiln was in an almost perfect state, although at least 1,600 years old, and is the only one that has been seen in this country.

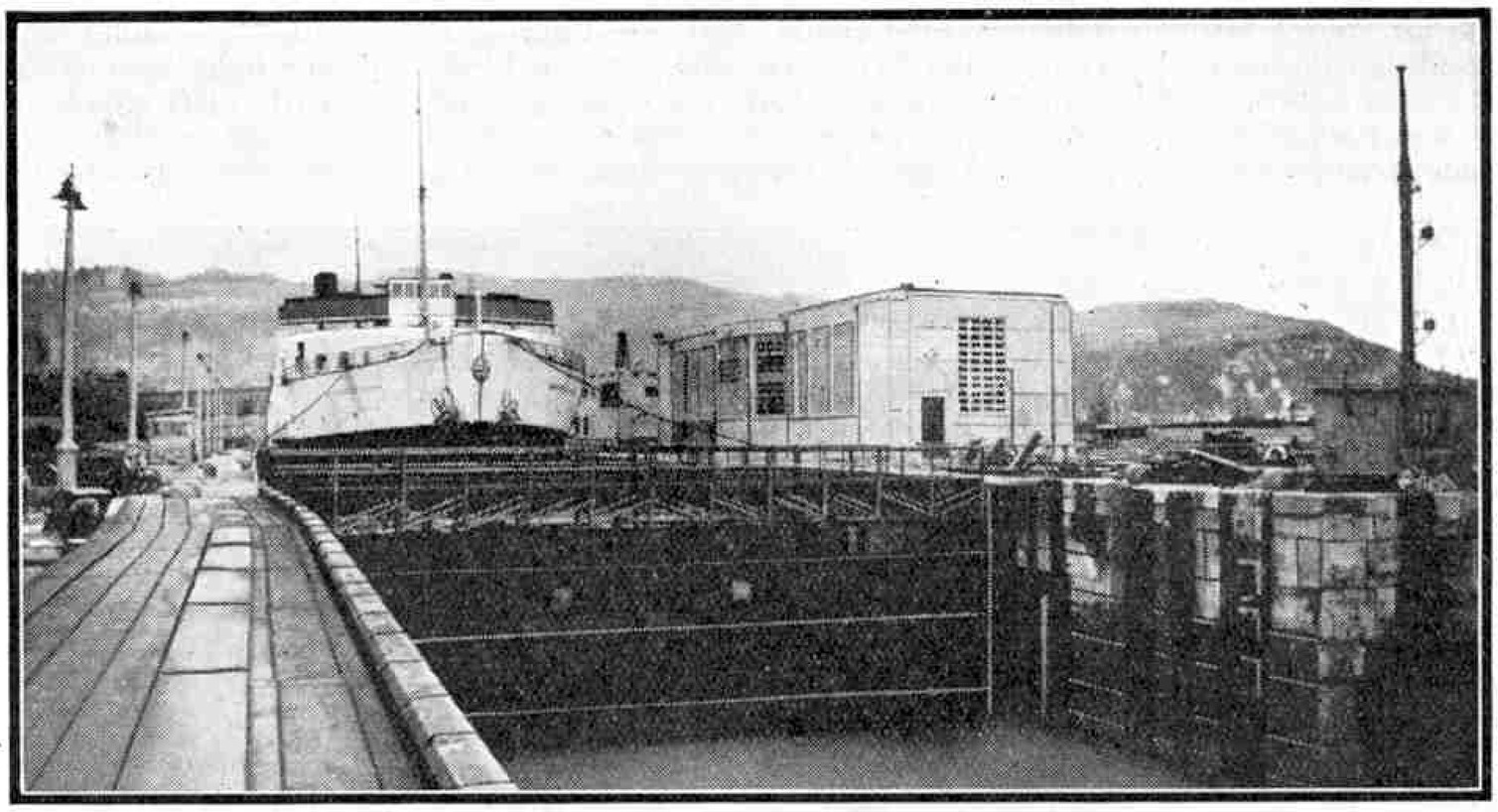
Strangely enough, we owe the discovery of this kiln to the tractor. When this is used for ploughing, the share bites more deeply into the land than that of a horse-drawn plough, and the owner of the field in which the kiln was discovered noticed that a part of the ground turned up by a plough behind his tractor had a darker appearance than the rest, and contained bits of broken pottery. He reported his discovery to Newbury Museum, and after careful excavation the kiln was uncovered. It owes its preservation for more than 16 centuries to the fact that the ground beneath the surface soil is solid chalk.

The kiln was cast in reinforced concrete, and the entire mass, weighing $4\frac{3}{4}$ tons, was then taken to London by road. The kiln is now on exhibition in the Science Museum, Mr. K. Chapman, the owner of the farm on which it was found, having presented it as a gift to the national collection.

Rays that Make People Invisible

Ever since the discovery of X-rays we have been threatened from time to time with the introduction of other and even more mysterious rays said to stop motor cars and aeroplane engines, to kill people who were unfortunate enough to stand in their path, and even to read our thoughts. The most recent of the many mysterious rays is one that makes things invisible. How this works has not yet been revealed, but it seems to be very effective, for the Italian professor who has introduced it has given many demonstrations of its power. On one occasion, when he was entertaining scientific friends to dinner, he used his ray to make every diner invisible to his neighbour so that each of his guests imagined that he was alone!

No doubt many uses eventually will be found for this interesting ray, and it has already been suggested that it may be used for making aeroplanes, guns and other implements of war invisible to the enemy.



The "Shepperton Ferry" in the new dock for the S.R. Channel train ferry at Dover. The making of this dock is described in the article on page 140 of this issue. Photograph by O. S. Nock.

Growing Bamboo in the West

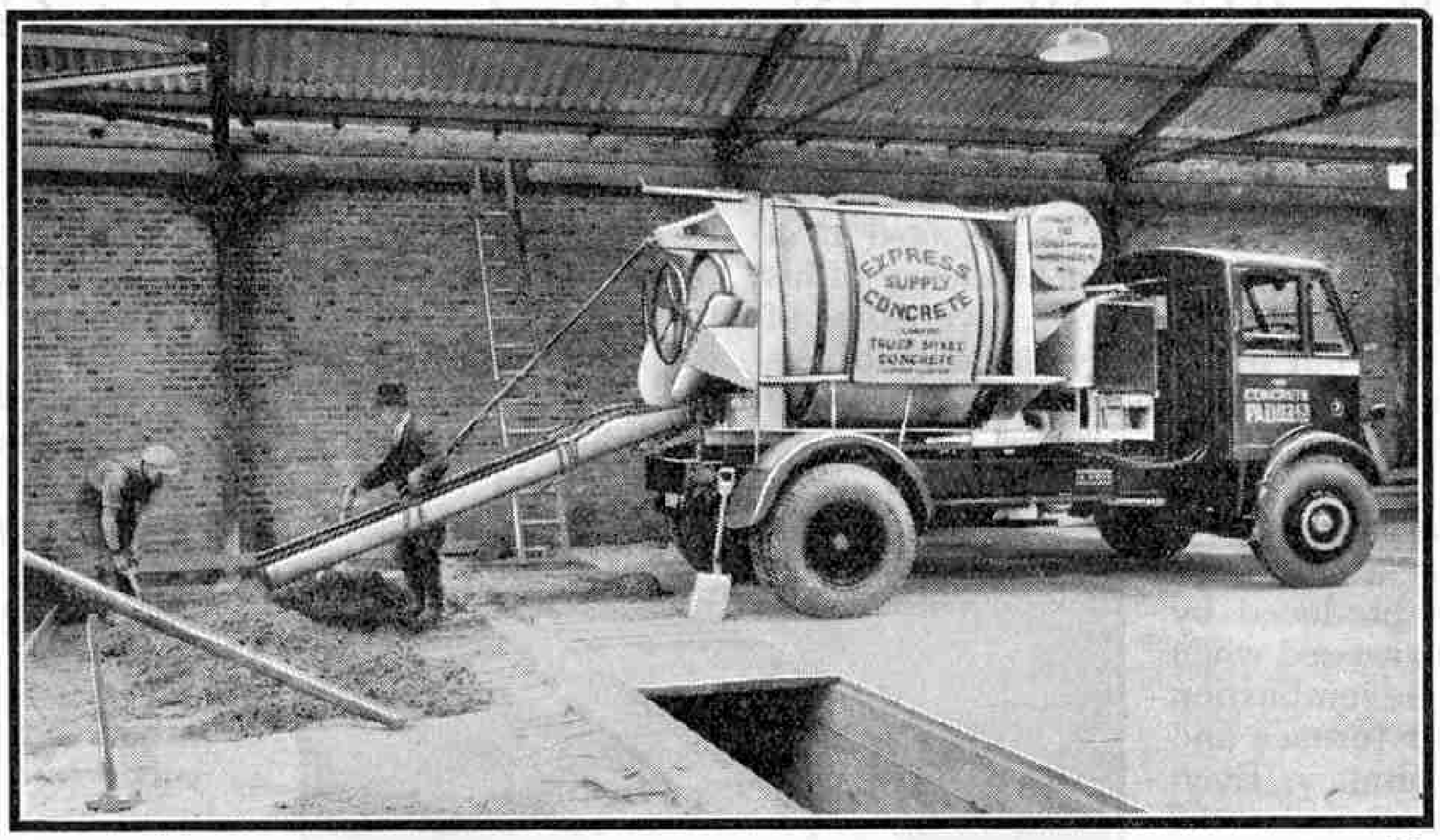
The strangest and most valuable grass in the world is bamboo. In the East bamboos of various species are used for so many purposes that the people there probably cannot imagine an existence without them. There are bamboos that are eaten in various forms. Some species produce edible seed, which is eaten as grain by the natives of India, and in the Far East the sprouts of the bamboo are cooked and served as vegetables. In this connection it is interesting to find that asparagus was known as "foreign bamboo" when it first appeared in China and Japan.

It seems strange that bamboo should be of such overwhelming importance on the western side of the Pacific Ocean, and should be comparatively rare in the New World and in Europe. In the United States and in Europe it is chiefly used for making fishing rods and poles for various circumstances. It may become more generally useful in the West, for efforts to grow bamboo on a commercial scale are being made in many countries. Some day bamboo may be the staple raw material for the making of paper, for it is suitable for this purpose and has the advantage of growing very quickly. A bamboo plant shoots upward to reach its greatest height during a single growing season, unlike an ordinary tree, which continues to grow year by year. It is easily produced from pieces of undergrown stems planted in the ground and kept moist, and does not require a high temperature, contrary to the usual belief that it is a tropical plant. There are many hardy varieties that can well be grown in France, Russia and the United States, and at least one Japanese species flourishes where winter snows are very heavy. America's largest bamboo grove has been established at Savannah, Georgia. Trials are being given there to many new types of bamboo from various parts of the world, and clumps of plants marked with tags are carefully watched as they grow.

A Travelling Concrete Mixer

The foundation of a new industry is always a matter of general interest, particularly when it brings with it a speeding up of work, and an increase in efficiency. An innovation of this kind that is now little more than a year old is the supply of ready mixed concrete.

When concreting work is to be carried out, the usual plan is to assemble all the materials required on or near the site, and to mix them there. This plan has the disadvantage that the plant takes up valuable space, and it is not always possible to rely upon the quality of the concrete produced, owing to variations in mixing operations. Now fixed central depots have been established where the ingredients of the concrete are weighed out for delivery into a special drum or container on a lorry. The container is in fact a mixer. It is mounted on trunnions so that it can be rotated, and is provided with paddles to turn over its contents. The concrete therefore can be prepared on the journey to the place where it is required, and is ready for use immediately on arrival.



A truck mixer delivering concrete. The cement and other materials are mixed in the large drum on the lorry while in transit. Photograph by courtesy of Express Supply Concrete Ltd., London.

The upper illustration on this page shows an 80 h.p. A.E.C. chassis fitted with a mixer delivering concrete. The mixer is of 2½ cu. yd. capacity, and is driven by a separate 14 h.p. engine. The cement, sand and shingle required for a batch are weighed in the central plant by means of automatic machinery and delivered into the container, while the exact amount of water required is dropped into a tank placed between the cab of the lorry and the mixer. After the container is sealed, the lorry departs for its destination, and at a prearranged time the mixer is started and run for some minutes. Water is then released from the tank into the drum, the whole operation being so timed that the concrete is ready for pouring when the journey comes to an end. A door at the back of the mixer is then opened and the concrete poured out, the rotating paddles lifting it through the opening. The water tank has a separate compartment in which is stored additional water for adding to the concrete if necessary, or for washing out the drum.

One of the greatest advantages of this new method is that haphazard measuring of quantities and mixing are avoided. The ingredients are thoroughly tested before use, and they are weighed out so accurately by the automatic plant used that each batch has exactly the specified composition.

Preventing Dampness

In cold weather many people complain of draughts in their rooms, and some go so far as to attempt to close up all tiny openings and crevices under doors or elsewhere through which the annoying cold air enters. If a room is heated by a fire the air must get through, however, for both the fire and the people in the room require the oxygen in it, and there is a natural circulation of air owing to the passage of hot gases up the chimney. There is a steady flow of air towards the fireplace, and more air must enter the room to take the place of that used or carried up the chimney.

It will be seen that the draughts complained of have their uses, and the great problem of ventilation is to ensure an adequate supply of clean air without producing unpleasant variations in temperature or in the proportion of moisture present. Air conditioning is now interesting railwaymen as well as architects, and the day may not be far distant when conditioning plant of some kind or other will be incorporated in all long-distance railway trains and in all but the smallest of buildings.

Ventilation is important from another point of view. This was well illustrated a few years ago in the case of a solicitor's strong room that could not be dried after it was built. A gas jet was kept burning day and night in the room, but in spite of this the papers stored in it invariably became damp. The problem was solved by extinguishing the gas jet and inserting two ventilating bricks in the wall. At once the room began to dry out, and there was no more trouble with dampness, the comparatively tiny current of air flowing through the strong room being far more effective than the high temperature produced by the burning gas jet. In all cases where dampness has to be cleared, free ventilation seems to offer the best means of accomplishing the task, although of course this is ineffective if the source of the dampness is a continuous inflow of moisture that cannot be stopped.

Block of Marble Weighing a Million Tons

Anything that is gigantic, and possibly the largest of its kind in the world, is always of interest. A book that is of unusual size has made its appearance in the United States. It weighs about a hundredweight, and its pages are 4 ft. in width and 1 ft. 6 in. in depth. This mammoth volume is used for entering the results of research work by a Professor of Psychology, and it would be interesting to know if there is any record of a book that is larger.

Work on the silkworm farm described on page 154 of this issue. The straw arches on which the silkworms spin their cocoons are being placed in position. Photograph by L. Hugh Newman, Bexley.

Another example is a gigantic block of marble weighing about a million tons. This was torn away in one piece from the side of an Italian mountain by a gigantic explosion, in which 120 heavy charges of dynamite were detonated at the same time. The great blast attracted many spectators, and it is believed that it will take 2,000 workmen six years to cut up the huge block of marble into sections for shipment overseas.

Oriental Plant that Yields a Valuable Oil

An oriental plant that may soon be grown on a large scale in the United States is the perilla, a member of the mint family that grows to a height of about 12 ft. The importance of this plant lies in the fact that its tiny brown seeds contain 40 per cent. of oil that is valuable in making paint and in waterproofing cloth, while from the residue a valuable fertiliser can be made. Perilla oil to the value of about £1,000,000 is imported annually in the United States, and it will be a great advantage if some of this can be produced in the country.

Raising Steam with Waste Heat

Boiler "Fired" by Diesel Engine Exhaust Gas

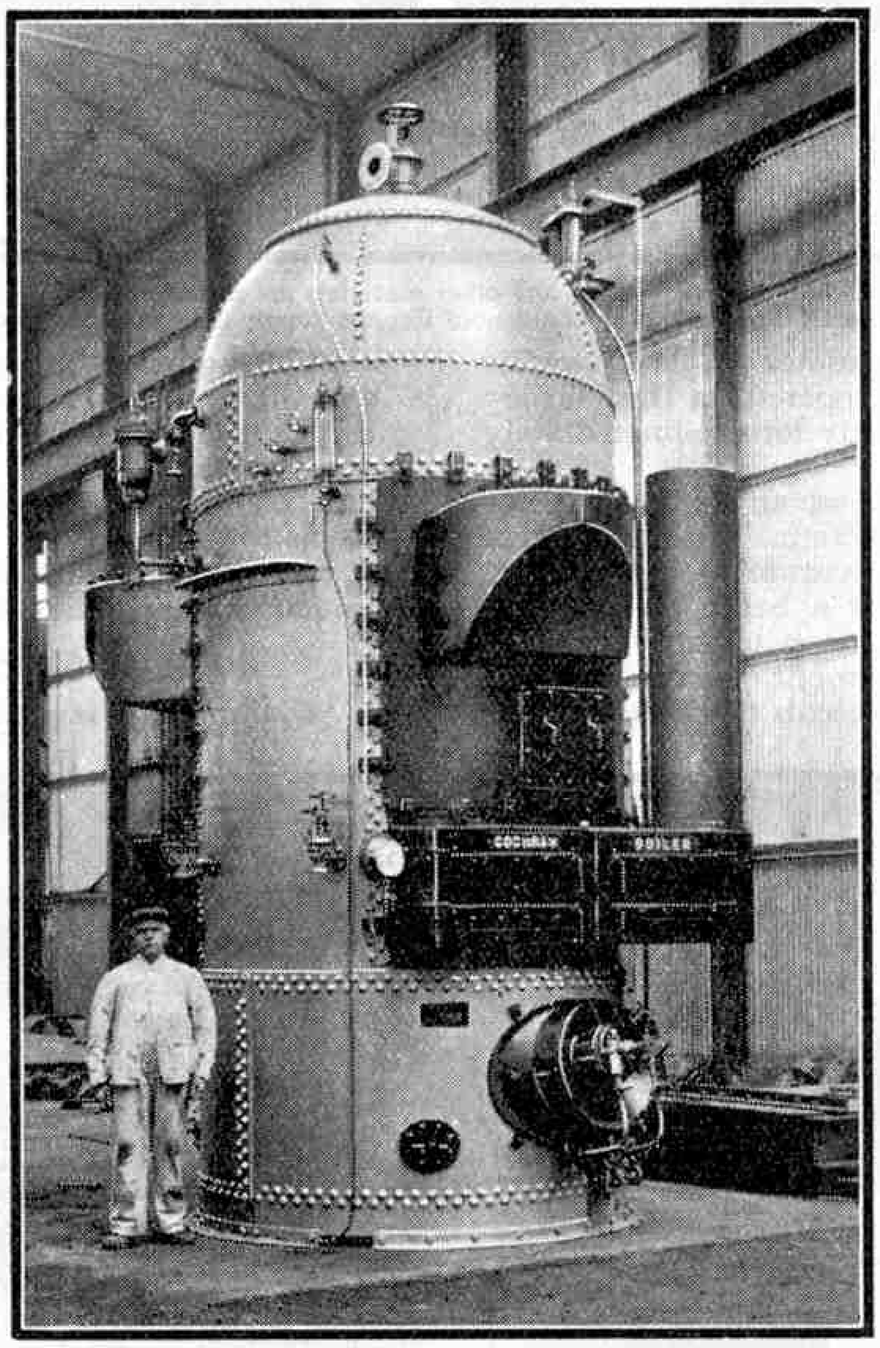
THE engineer responsible for the design and construction of power plants of all kinds is engaged in a continual struggle to prevent waste. The efficiency of his creations is reduced by a variety of losses. Over some of these he has no control, but he is always seeking for the sources of others and devising means to prevent the drain on power to which they give rise.

In steam power plants there is a severe loss when raising steam at the very beginning of the process of generating power, for a large proportion of the heat produced by the burning of fuel is wasted when hot gases leave the combustion chamber of the boiler furnace and pass away up the chimney. Even in the most economical boiler the loss from this source is at least 12 per cent., and similar losses occur in all cases where fuel of any kind is burned, in forges, rolling mill furnaces and gas-making retorts, as well as in boiler plants.

Where large quantities of fuel are burned, some kind of apparatus usually is installed to extract a part of the surplus heat of the waste gases and turn it to profitable account. For example, in a boiler plant the waste gases from the furnaces generally are led through what is known as an economiser, in which incoming feed water is heated before it reaches the drums and tubes of the boilers. An economiser consists of a nest of iron tubes in a special chamber, which is placed between the furnace and the flues leading to the chimney. The feed water is pumped through the tubes on its way to the boiler, and the hot gases circulate between the nests before escaping. In this way much of the heat retained by the gases is transferred to the water.

Where the temperature of the waste gases is extremely high, as in a blast furnace, the heat is often used to generate steam in a special type of boiler known as a waste heat boiler. There are many different forms of waste heat boilers, and one type called the "Composite" is illustrated on this page. This is a development of the standard multitubular vertical boiler manufactured by Cochran and Co. (Annan) Ltd., and is designed specially for raising steam from the waste heat contained in the exhaust gases of large Diesel engines, such as those installed in motor ships. Normally the hot exhaust gases of such an engine pass through a silencer, and thence into the funnel and so to the open air. By placing a boiler of the type illustrated on this page between the exhaust ports of the engine and the funnel, however, the greater part of the heat contained in the gases can be extracted and utilised for steam raising. The steam is then employed to operate pumps and other auxiliary plant on board the vessel.

There are various types of Cochran boilers for the utilization of waste heat from a Diesel engine operating on board various classes of ships. In the simple type adapted for waste gas only, the gases from the Diesel engine are led through the base of the boiler into a firebox or furnace arrangement. They pass through an uptake pipe into a combustion chamber and then through a nest of tubes into the funnel.



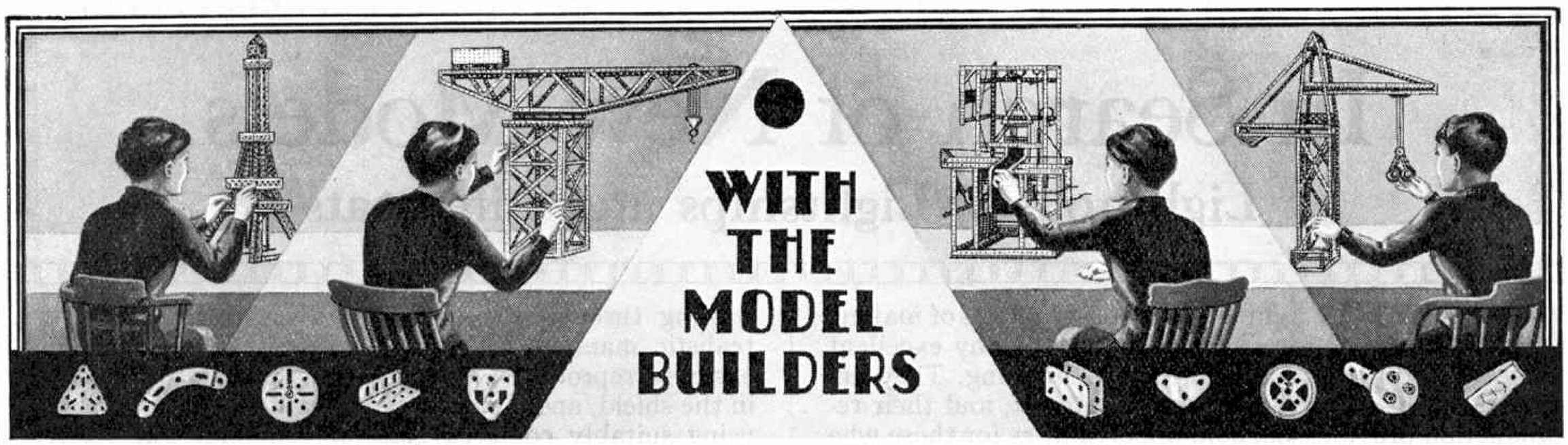
A Cochran "Composite" boiler designed to utilise the waste heat from a Diesel engine. Provision is made also for firing the boiler with oil. Photograph by courtesy of Cochran and Co. (Annan) Ltd.

In all cases the boiler is set up vertically, and this is the most efficient type of steam generator, for all the heating surface and the water and steam spaces are above the "fire." The "Composite" type illustrated on this page is designed specially for utilizing the waste heat when the engine is running at sea, but the boiler is arranged also with a lower section for raising steam from oil fuel when the vessel is in port and no waste heat is available. A further adaption is sometimes supplied for firing alternatively by waste gas or oil fuel, but the most common practice on board ship is to adopt the "Composite" type.

The Cochran boiler has a hemispherical crown, while the firetubes are so arranged in the tube plates that they provide a very efficient medium for rapidly converting water into steam, which rises and collects in the steam space above the water level. The internal arrangement also is specially designed for the easy cleaning of the boiler, so that its efficiency can always be maintained at the very highest possible rate.

Waste heat boilers on board ship are used, among other purposes, to provide steam for operating winches and deck machinery. This is the reason why the "Composite" type is so popular, for the main engines are not in use when the ship is in port and, consequently are not giving out any exhaust gases. Then it is that the oil burners in the lower section of the boiler are brought into play. The hot gases from the burning oil pass through an independent nest of tubes into a funnel separate from that of the exhaust gas or waste heat section.

The Cochran boiler is ideal for use on board ships for owing to its vertical construction it takes up little floor space and does not require any external framework or brickwork setting, as do watertube boilers.



GEAR TRAIN FOR CLOCK STRIKING MECHANISM

Judging from the number of letters we receive containing details of new clock mechanisms, clock building is very popular with Meccano enthusiasts. It is very satisfying to design such a delicate mechanism as a clock and adjust it correctly, and the scope offered for individual enterprise is very wide. For example, one of our correspondents, E. Kemp of Mile End, Australia, has constructed a turret clock that incorporates a simplified form of a complicated rack striking mechanism that is generally used in clocks made in France. For this it was necessary to devise a simple mechanism that would rotate a wheel through one revolution to every 78 revolutions of a primary shaft. Various mechanisms such as a ratchet and chain device and the Meccano Intermittent Rotary Striker (S.M. 68) were tried, but none of them were entirely successful. Kemp set to work therefore to design a ratio 78 to 1 reduction gear. This proved a rather difficult problem with the gears available, but Kemp solved it by meshing a $\frac{7}{8}$" Bevel Gear with 26 teeth with a Worm, thus obtaining a 26 to 1 ratio, and adding a 3 to 1 reduction by means of a 57-teeth Gear Wheel and a Pinion Wheel of $\frac{1}{2}$" diam.

The striking mechanism is operated by a 10 lb. weight that has a drop of 6 ft. to the floor, and it runs for 30 hours at one winding. Kemp is now endeavouring to obtain a set of bells of suitable tone for use in a chiming mechanism that he intends to construct.

A NEW MECCANO GAME

A pleasant change from ordinary model-building is provided by the construction of games and amusement devices. The possibilities in this direction are sufficiently great to entice most model-builders at one time or another to desert temporarily the construction of cranes, motor cars and such popular models, and to concentrate for a time on the making of toys for the amusement of themselves and their friends.

Many interesting games constructed from Meccano parts have been described from time to time in the "*M.M.*," and here we are giving details of an electrically-operated ship-piloting game that has been devised by A. Herdman of Rochester, and is constructed almost entirely of Meccano.

In this game a built-up tank contains water on which a small ship floats. Underneath the tank are a number of Elektron Magnet Coils, all of which are connected to a simple control switch that enables any one of them to be energised at will. By skilful use of the switch it is possible to pilot the vessel to any required point of the tank.

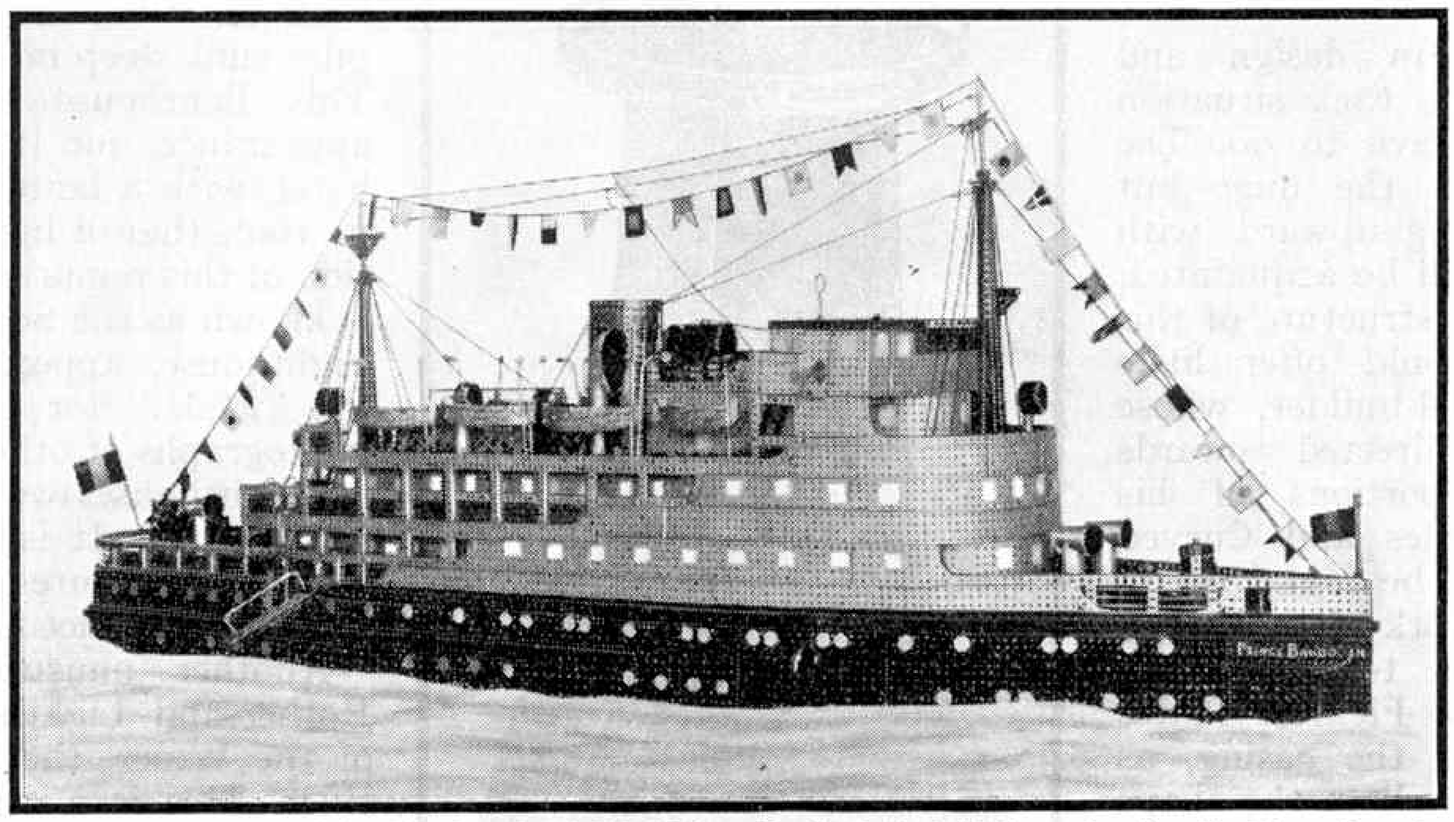
The tank consists of two oblong frames made up from 24$\frac{1}{2}$" and 12$\frac{1}{2}$" Angle Girders. These are joined together by 3$\frac{1}{2}$" Angle Girders, and the base and sides of the box-like structure so formed are then filled in with sheets of plywood. All the joints in the wood and the edges are stopped with putty, and the inside of the box is then varnished so as to make it watertight. The tank is mounted on a further framework of Strips or Angle Girders, and underneath it are fixed a number of Elektron Magnet Coils complete with Cores. The Coils may be mounted in positions to suit the wishes of the model-builder, and they should be placed so that the tips of the Cores are against the bottom of the tank.

Inside the tank rocks are fixed. These may be represented by lumps of sandstone or coal, or by small frameworks of Strips covered with brown paper and varnished.

The ship is cut from a piece of wood and to its bottom a strip of iron or steel is fixed. When any one of the Magnet Coils is energised by manipulating the control switch the strip of metal is attracted by the Coil, towards which the vessel moves.

The control switch is made as follows. A Circular Strip (Part No. 145) is attached to a box-shaped frame by means of Double Brackets, but is insulated from it by means of Insulated Washers on the connecting bolts. A 3$\frac{1}{2}$" Strip is pivotally attached to the framework so that when pressed it makes contact with the heads of 6BA Bolts that are fastened at intervals round the circumference of the Circular Strip. The various 6BA Bolts on the Circular Strip are connected to the outer terminals of the Magnet Coils. The inner terminals of the Magnet Coils are connected altogether, and a lead is taken from them to a terminal fastened to the frame of the tank. A further terminal is attached to the switch frame, and together with the terminal on the tank is connected to the poles of a battery.

Each person taking part in the game is required to pilot the ship to various points in the tank without hitting any of the rocks. To do this skilful use of the control switch is necessary, and it is good fun to watch the frantic efforts of the players to prevent the vessel hitting the rocks!



A fine model of the Belgian Diesel-engined ship "Prince Baudouin," which is employed on the Channel service between Ostend and Dover. The model reproduces almost all the external features of the vessel, and was built by M. de Wilde, Hoboken, Antwerp.

SOME USEFUL BEARINGS

When a shaft of a model is rotating at high speed, or is subject to very heavy loads, the holes in Plates and Strips do not provide sufficient bearing surface for the Rod, and tend to wear rapidly and unevenly, thus impairing the smooth running of the mechanism. It is advisable therefore to reinforce any bearing surfaces that are subject to great strain and this can be done in several ways. The most simple method, and one that is of interest particularly to owners of small Outfits, is to bolt a 1$\frac{1}{2}$" Strip or a Flat Bracket to the Strip or Plate in which the Rod is journalled so that the bearing surface is doubled.

Owners of larger Outfits will find many of the bossed Meccano parts, such as the Double Arm Crank, even more satisfactory for the purpose. Bearings reinforced in this manner will stand all the strain likely to be imposed upon them in even the largest models, and such parts possess the advantage that their set screw holes can be used as oil holes for lubricating the bearings. Alternatively Meccano Grease Cups may be screwed into them.

The Crank and the Double Arm Crank are specially useful also for making big-end bearings and plummer blocks, or for use in positions where the Bush Wheel and similar parts could not be used. Rod Sockets (Part No. 179) are other parts that can be put to good use in this respect, for they can be employed in very small spaces. If any difficulty is experienced in bolting a Rod Socket in position, the Grub Screw should be removed from its hole and replaced with a $\frac{3}{4}$" Bolt or a short length of Screwed Rod. By holding a Spanner over the nut and turning the Rod Socket by means of the $\frac{3}{4}$" Bolt, a much tighter fixture can be obtained than would be possible with the fingers and spanner alone.

LOCOMOTIVE DRIVING WHEELS

Many model-builders interested in locomotive models ask for advice on the construction of suitable driving wheels. Suggestions have frequently been put forward that a large circular plate should be introduced for use in conjunction with the Ring Frame (Part No. 167B) to form a large flanged wheel. Such a part undoubtedly would be useful for this purpose, but it is only in very rare cases that driving wheels of this diameter are required and otherwise its scope would be very limited.

A better suggestion is that put forward by P. Mills of Harrow. Mills proposes that the Roller Race (Part No. 167A) should be manufactured with the gear ring as a separate part and provided with suitable lugs to enable it to be bolted to the large circular centre plate, which would have a diameter of 11 in. An objection to this scheme is that the strength of the Roller Race would be considerably decreased, and the bearing would not run as smoothly under heavy loads as the present unit.

A NOVEL ELECTRICAL MODEL

A novel electrically operated model that we think will interest model-builders generally has been built by J. McHutchon, Glasgow.

The chief feature of the model is an ingenious fire alarm device, and the complete arrangement consists of a house and a fire station containing a model fire-engine. If a match is struck in the house to represent a fire, an alarm bell rings in the fire station, the lights are switched on, and the doors fly open to allow the engine to run out under its own power.

Although all this may appear very complicated the automatic operation of the model is achieved in a simple manner. The operating device is based on the fact that metals expand when heated. Stretched between two terminals in the house is a piece of thin copper wire. Below the wire at its middle point is mounted a 6BA Contact Screw, which is placed very close to the wire, but not actually in contact with it. The wire and 6BA Screw form part of an electric circuit in which is included a bulb, an electric bell and a Meccano Electric Motor. The heat of a lighted match held beneath the wire causes it to expand, and thus to sag, and make contact with the 6BA Screw to complete the electric circuit. The electric motor then raises the door of the fire station.

Attached to the top of the door is a cord that passes over a pulley and carries a weight that is not quite heavy enough to raise the door by itself. The weight is suspended from the roof of the fire station. The fire-engine is a simple built-up affair and incorporates a No. 1 Clockwork Motor, which is placed so that the brake lever projects from the rear of the body. The fire-engine is placed in the station in such a position that the Motor brake lever is just below the weight. A second cord is attached to the fire station door, and after passing over a pulley is attached to the shaft of the Electric Motor.

When the electric circuit is completed by the heating of the copper wire, the bell in the fire station starts to ring and the light is simultaneously switched on. Meanwhile the Electric Motor is set in motion and the cord attached to its shaft raises the door. The weight drops and releases the brake on the fire-engine motor.

In Search of New Models

Lighthouses, Lightships and Life-boats

LIGHTHOUSES, lightships and other means of making our shores safe for seafarers provide many excellent subjects of different types for model-building. They are themselves of the greatest general interest, and their reproduction provides splendid opportunities for those who like to give their models such attractive touches as electric lighting and other additions that add life and realism.

The lighthouse itself is the outstanding subject in this interesting group. Details of many famous lighthouses can readily be obtained from books and magazines, and good illustrations of lighthouses have appeared in the "*M.M.*" In addition most model-builders have climbed to the lantern of some lighthouse or other, and have themselves taken interesting photographs that will be useful as guides to accurate reproduction.

Lighthouses differ in design and equipment according to their situation and the work they have to do. The most familiar type is the huge but graceful tower, tapering upward, with which most readers will be acquainted. The reproduction of a structure of this kind in Meccano should offer little difficulty to the model-builder, whose chief efforts will be directed towards maintaining the proportions of his prototype. Ring Frames and Curved or Circular Strips will be found useful in shaping the framework of the tower, and for forming ribs to which the casing can be secured. Flexible Plates are most suitable for the casing, as they can be adapted well to the shape required. Strips also can be used for this purpose, and a structure with the solid and substantial appearance of a lighthouse can readily be made with the aid of either of these parts.

The lantern of a model of this kind needs particularly careful construction, particularly if a flashing light is to be installed and this is to be in keeping with that of the original. The arrangements necessary for a flashing light are simple, and should certainly be made, for even a miniature lighthouse without a light that sends out its beams correctly is apt to be "dead" and uninteresting. One suggestion for producing a flashing beam is illustrated in Fig. 1. The lamp in the model lighthouse shown in this illustration is surrounded by a cardboard shield in which a gap is cut out, the space being filled with tracing linen, which is sufficiently transparent for model purposes. Stout tissue paper, or a small sheet of celluloid, could be used equally well for this purpose. The shield is mounted on a Rod driven by an Electric or Clockwork Motor through worm reduction gear, and as it rotates the beam of light passing through the opening travels round in a very realistic manner. Different combinations of flashes can easily be reproduced by cutting appropriate slots or gaps in the shield, and a green or red beam can be obtained by using suitably coloured glass or celluloid. The relative durations of the flashes depend on the widths of the gaps, and the actual times of the successive periods of light and darkness are governed by the speed of the driving rod, which is a matter of gearing.

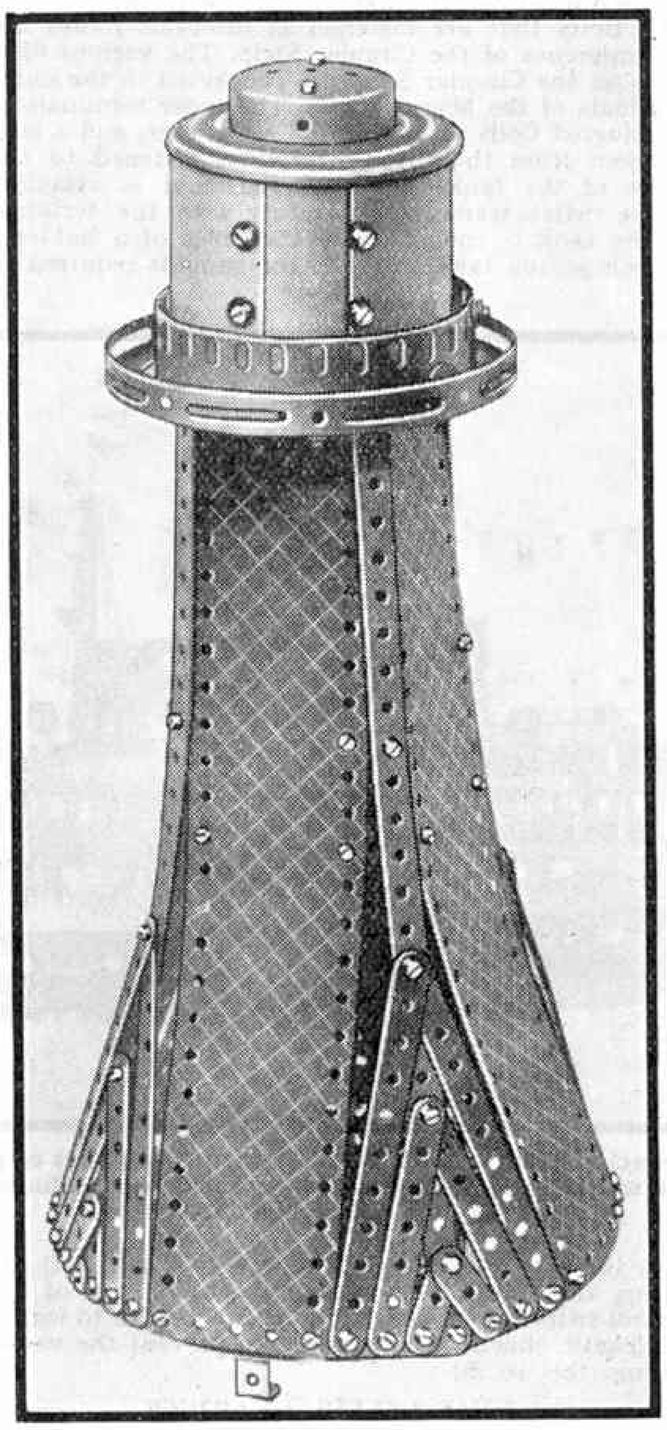


Fig. 1. Lighthouses make excellent subjects for Meccano model-building. The model shown in this illustration is an easily built example.

Lighthouses are not all built on the lines of the familiar cylindrical towers, however, and those who are on the look out for unusual models of this type can find what they need in lighthouses abroad and in America. For instance, in San Francisco Harbour there is a lighthouse that seems to be built on stilts, for it is carried on iron piles sunk deep into the bed of the sea. This lighthouse also is unusual in appearance, for it looks more like an hotel, with a lantern tower perched on its roof, than a lighthouse. An illustration of this remarkable structure, which is known as the South Hampton Shoals Lighthouse, appeared on page 711 of the "*M.M.*" for December 1935, and photographs of other interesting American lighthouses were reproduced in the same article. It is interesting to study all these structures, and to see how they can be reproduced in Meccano.

Another unusual structure is the Rothersand Lighthouse, at the mouth of the Weser, the well-known German river. This is a cylindrical tower, but instead of being built on rock it rests on a gigantic steel caisson filled with concrete. From the model-building point of view its most interesting feature is its head, however, for this appears to be turreted, like the tower of a castle.

Another source of good models is to be found in the various types of lightships used to give warning of shoals or sandbanks, and to mark navigable channels in the estuaries of important rivers. An excellent demonstration model of the well-known Bar Lightship in the estuary of the River Mersey was illustrated on the "*With the Model-Builders*" page in the "*M.M.*" for March 1933. This model is fitted with a simple crank-actuated rocking motion that causes the vessel to pitch and roll in a most realistic manner. The deck work and superstructure reproduce all the characteristics of those of the actual vessel. Strips play an important part in its construction, and a Boiler is used for the lamp turret.

Models of this type can be built either as waterline models, or the hulls may be reproduced completely. Generally waterline models are the most satisfactory.

The actual arrangements of the light turret and the operating mechanism vary considerably in different vessels, but the model-builder will find no difficulty in settling details of this kind if he obtains an illustration of the actual ship on which he intends to base his model. The deck fittings usually are similar to those found on an ordinary boat. The equipment always includes at least one life-boat, and this can be represented simply and easily by two Strips bolted together.

Buoys also may attract the model-builder. They take a variety of forms. Some have flashing lights and others are fitted with bells that ring as the buoy pitches in the waves. The Gong included among Meccano Elektron parts will be found useful in a model of this kind.

Other devices connected with the sea that offer plenty of scope for model-building are the life-boats stationed at various points around the coasts. The early life-boats were merely strongly constructed open boats that had a large beam in proportion to their length, so as to render them stable in heavy seas. Some of them were propelled entirely by oars, but others were fitted with sails as well, and sailing vessels can still be seen at some of our life-boat stations. Modern life-boats represent a great advance on their predecessors, and usually are propelled by a powerful petrol or oil engine augmented by sails. They are equipped with a heated enclosed cabin for the shelter of rescued persons, and also with a shelter for the man at the wheel.

The construction of different types of life-boat alone would keep the model-builder busy for a considerable time, and he would find the work unusually interesting. There is no lack of suitable material, for illustrations of life-boats can be seen in many books, and information on these vessels and their equipment has been given in illustrated articles in the "*M.M.*" A typical example of a Meccano model of a life-boat is shown in Fig. 3. Its attractive lines make this a model well worth building, and constructing an original model of a similar kind is good fun.

The interest and excitement can be increased by adding launching equipment, and actually building up the scene of a launch on a dark and stormy night. A life-boat takes to the water in various ways. If the condition of the beach permits, it is launched on a wheel carriage that runs down launching ways. Where coastal conditions do not allow launching ways to be built, however, it is mounted on a special carriage that is hauled by horses or by a tractor into the sea until it has reached a depth at which it can be floated off. No difficulty will be experienced in designing and building a suitable wheeled launching carriage, and in constructing a simple tractor for hauling it into the water with its load. An ordinary tractor of course would not be suitable, and one that can work in the sea and is used for life-boat launching purposes, was described on page 722 of the "*M.M.*" for December 1936. Model-builders should have no difficulty in making good models of the tractor from the illustrations that were reproduced in the article describing it.

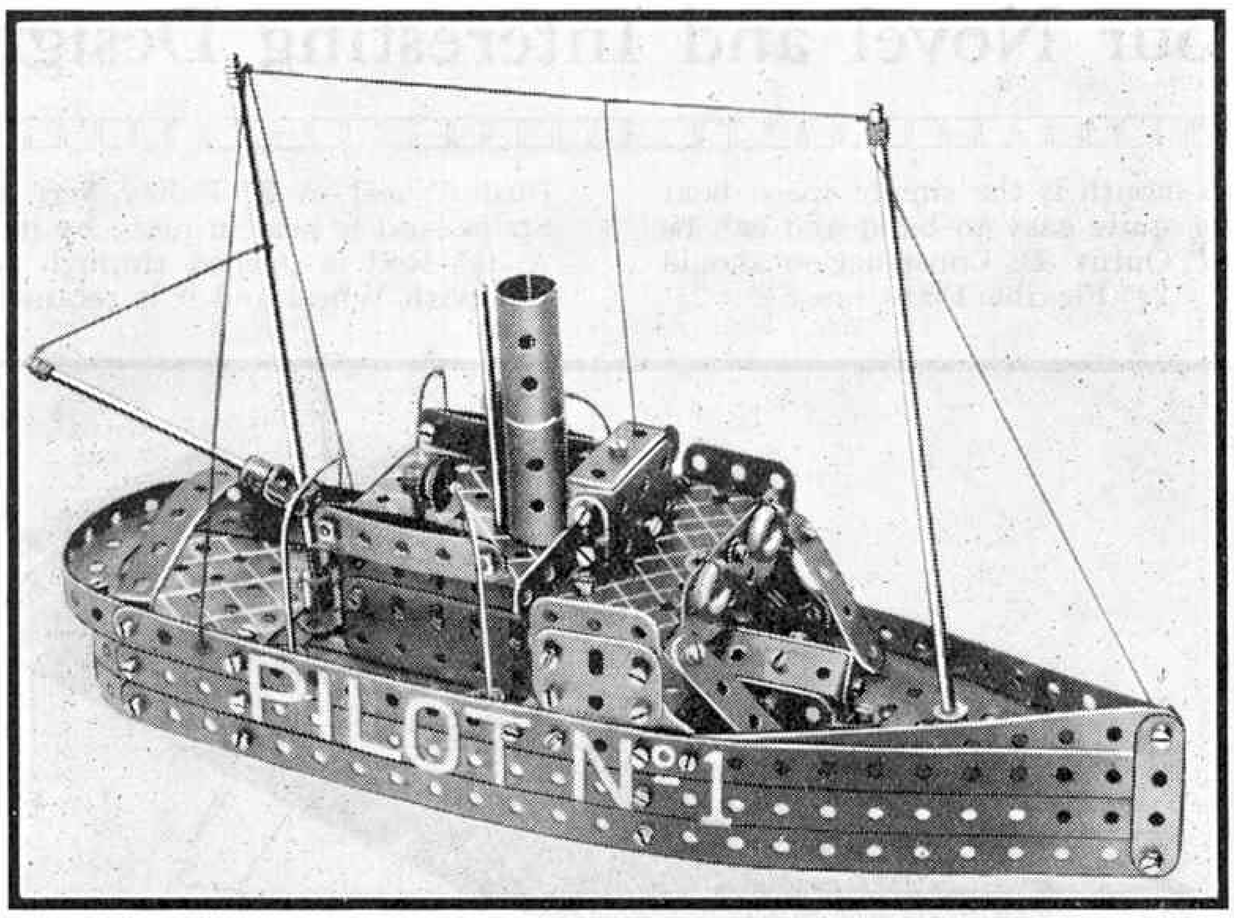


Fig. 2. One of the boats that takes pilots out to the stations where they await incoming ships. The purpose of such a boat is indicated by large white letters on the sides.

Although pilot boats are not directly associated with life-saving, they help to make our shores safe in that pilots from them guide large vessels along the often tortuous and intricate waterways leading to the docks of our seaports. These boats are familiar sights in such places as the Mersey Estuary, where they may be seen on their way to or from the pilotage stations at the Bar and Point Lynas. Their mission is obvious from the marking on their sides, and in view of their work of providing temporary homes for pilots they are of special construction. Their features are well brought out in the model of a pilot boat illustrated in Fig. 2. The lettering on the side of the model is made of cardboard.

Other interesting subjects for models are the various types of fire floats that are used to combat fires on board ships in docks and harbours. A modern vessel of this kind was illustrated on page 72 of the "*M.M.*" for February 1937. The main pumping equipment is situated in the engine room, and is of the centrifugal type. The water is sucked through pipes slung over the sides of the ship, and it is then pumped at high pressure to the monitor on the deck, which supplies the main water jet and can be swivelled to any position desired by turning handwheels. At its base there are several subsidiary outlets to which hose pipes can be attached. A model monitor is simple to make with a few Couplings, Handrail Supports, and similar parts.

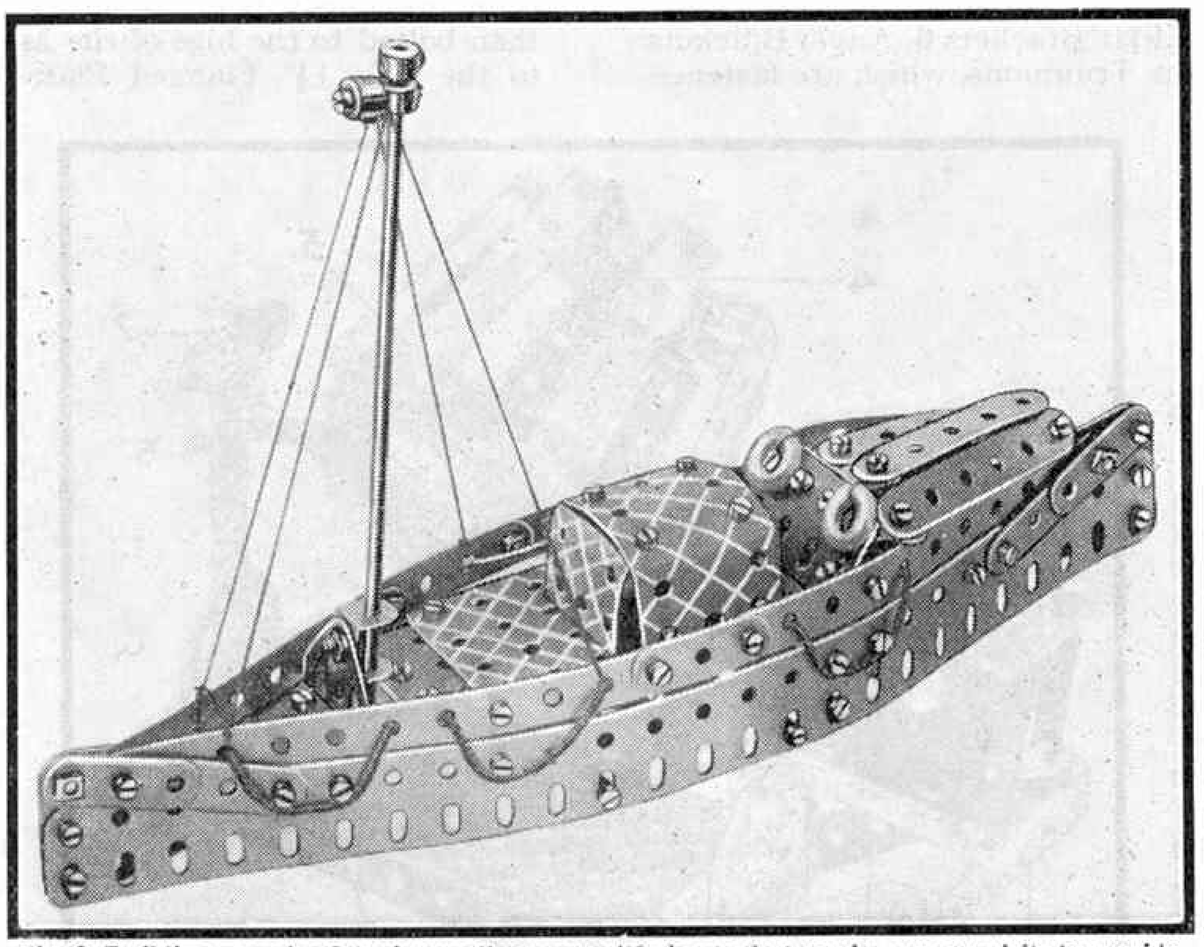


Fig. 3. Building models of the interesting motor life-boats that can be seen on visits to seaside places is great fun. A good example of such a model is shown above.

New Models for Small Outfits

Four Novel and Interesting Designs

THE first model described this month is the simple speed boat shown in Fig. 1. This model is quite easy to build and can be built up from the contents of Outfit B. Construction should be commenced by bolting one $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate, one $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate and one $5\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate to a $12\frac{1}{2}''$ Strip in the positions shown in the illustration to form one side of the hull. Two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are next fastened to the $12\frac{1}{2}''$ Strip by the bolts 1 and 2. The opposite side of the hull is built in a similar manner, and is then bolted to the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips already mentioned. Two $2\frac{1}{2}''$ small radius Curved Strips are fastened in the bows by a $\frac{3}{8}''$ bolt 3.

In the fifth hole from the bows of the $12\frac{1}{2}''$ Strip a $4\frac{1}{2}''$ Flanged Sector Plate is fixed, and a $5\frac{1}{2}''$ Strip is fastened in position by the same bolt, which passes through the sixth hole of the $5\frac{1}{2}''$ Strip. Two Flat Trunnions complete the bows. The $2\frac{1}{2}''$ Strip and the $2\frac{1}{2}''$ small radius Curved Strip are clamped in place by the bolt 4.

Construction of the cabin may next be commenced. For this a Flexible Plate is extended by a further $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate, and the compound plate thus formed is bolted to the $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets 5 by the Bolts and Flat Brackets 6. Angle Brackets connect the front of the cabin to the Trunnions, which are fastened to the $4\frac{1}{2}''$ Flanged Sector Plate. Two $2\frac{1}{2}''$ Strips, overlapped three holes, are fastened to the Flat Trunnions to form the side of the cabin.

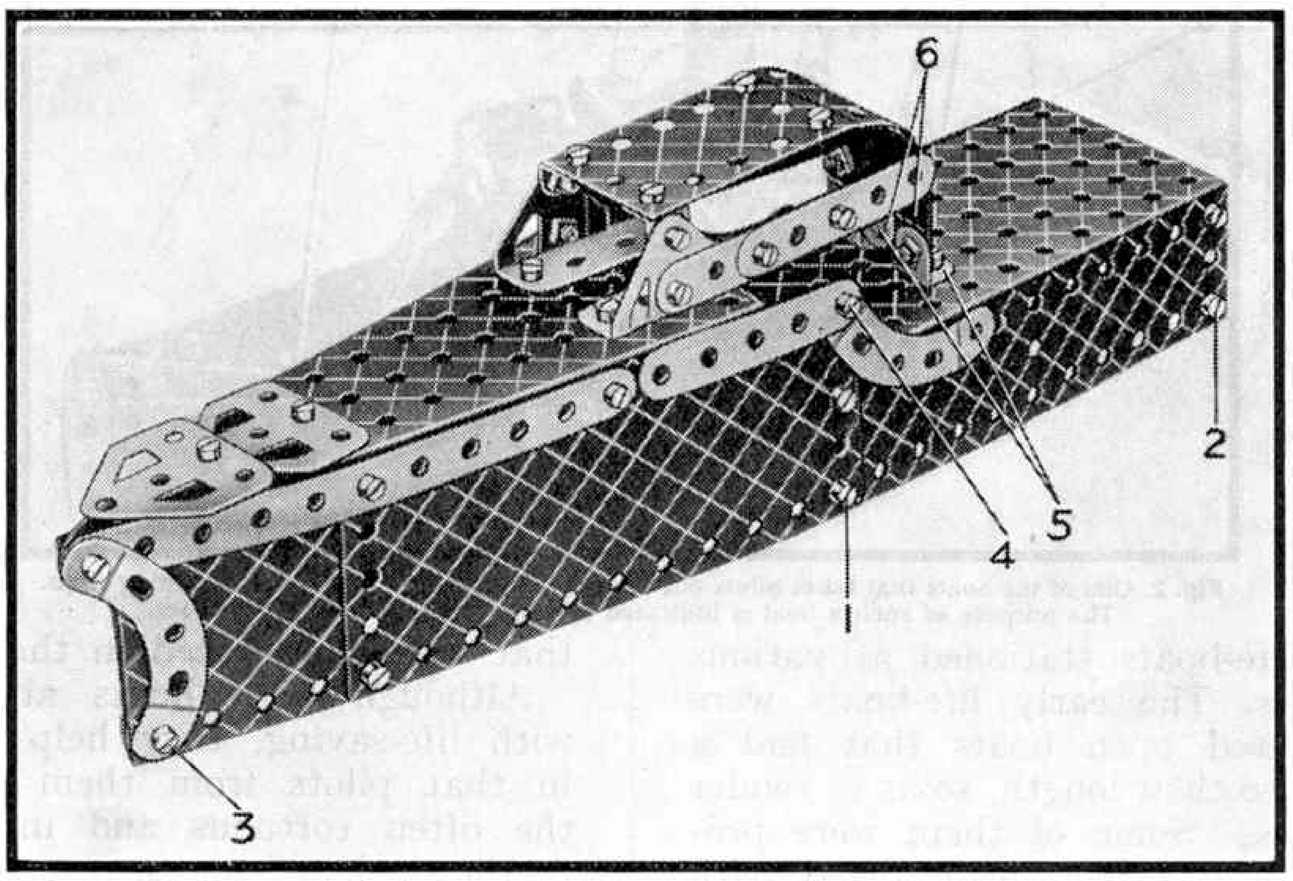


Fig. 1. A neat model speed boat that can be built with the contents of Outfit B.

Parts required to build the model speed Boat: 2 of No. 1; 2 of No. 2; 6 of No. 5; 3 of No. 10; 4 of No. 12; 38 of No. 37; 2 of No. 37a; 3 of No. 38; 2 of No. 48a; 1 of No. 52; 1 of No. 54a; 4 of No. 90a; 2 of No. 111c; 2 of No. 126; 2 of No. 126a; 2 of No. 188; 2 of No. 189; 2 of No. 190; 2 of No. 195.

Fig. 2 shows a model concrete mixing machine with a tipping and revolving mixing drum. It represents a type used frequently on road repair work, and in the construction of concrete buildings.

This model requires Outfit E for its construction, and it incorporates a *Magic* Motor, which is used to rotate the mixing drum. It is best to start building the model by constructing the framework that supports the *Magic* Motor. This consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, to each end of which is bolted a Trunnion extended by a Flat Trunnion. Two 3″ Strips 1 are bolted in the centre hole of the Flat Trunnion, as shown. A $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 2 is fastened to the 3″ Strip, and is supported at its free end by a $2\frac{1}{2}''$ Strip fastened by Angle Brackets to the $3\frac{1}{2}''$ Strips 3.

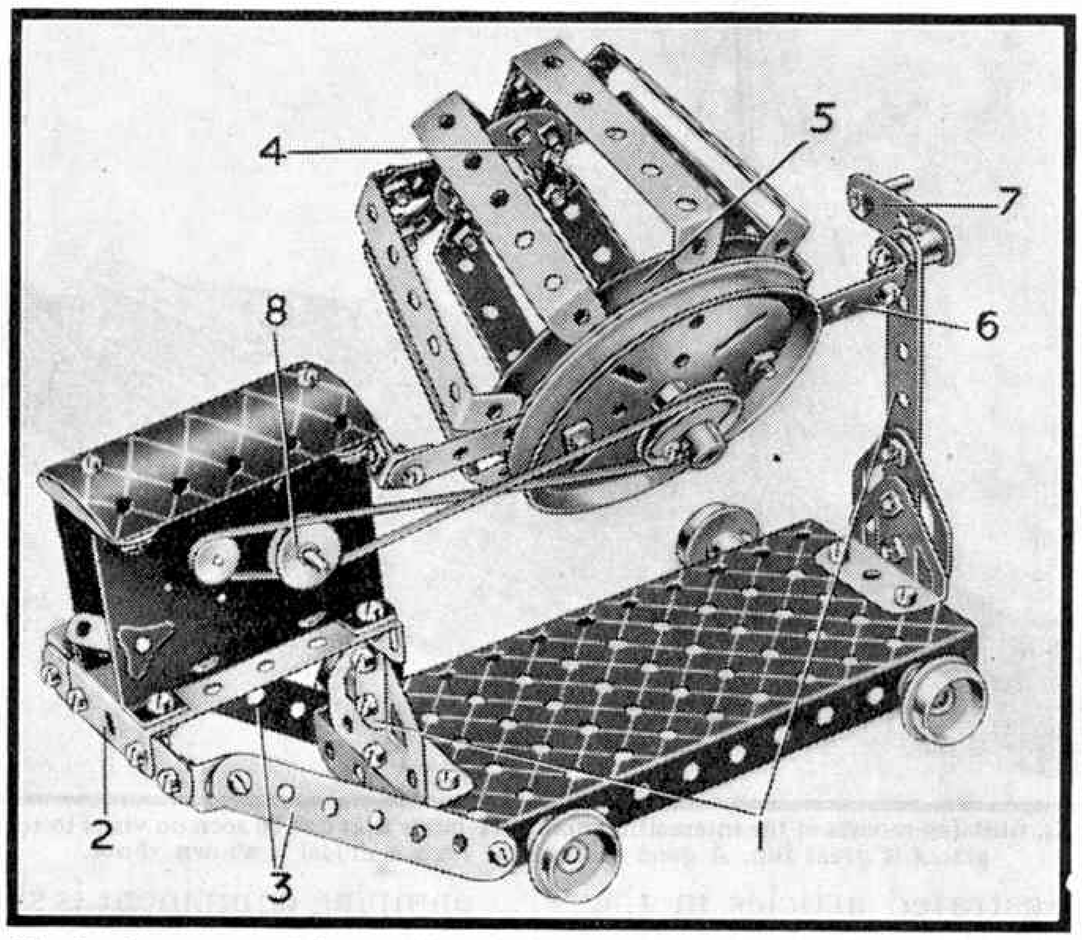


Fig. 2. A concrete mixing machine, built with Outfit E, that incorporates rotating and tipping mechanism operated by a Magic Motor.

The mixing drum is next built up. Eight Flat Brackets are bolted around the Bush Wheel 4, and the $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are fastened to the slotted holes of the Flat Brackets, so that they are spaced as far as possible from the centre of the Bush Wheel. A 3″ Pulley 5 is fixed between the Double Angle Strips, and is held in place by its groove engaging between them. A $3\frac{1}{2}''$ Rod is pushed through the bosses of the 3″ Pulley and the Bush Wheel and it is retained in place by set screws.

The tipping mechanism for the revolving drum consists of a $5\frac{1}{2}''$ Strip 6 with Angle Brackets bolted to each end. At the centre of the Strip a second 3″ Pulley is fixed by two $\frac{3}{8}''$ Bolts, care being taken to align the boss of the Pulley with the hole in the Strip. This assembly is then mounted in the framework already constructed. Two $\frac{3}{8}''$ Bolts are locked in position to the Angle Brackets at the ends of the $5\frac{1}{2}''$ Strip, and are pushed through the top holes in the 3″ Strips 1, washers being used for spacing purposes. A Crank 7, fitted with a Threaded Pin is secured to the $\frac{3}{8}''$ Bolt, and a nut holds the second $\frac{3}{8}''$ Bolt in position.

The $3\frac{1}{2}''$ Rod that supports the revolving drum is pushed through the boss of the 3″ Pulley on the $5\frac{1}{2}''$ Strip.

The *Magic* Motor may now be fitted. To do this two $1\frac{1}{2}''$ Strips are fastened by $\frac{3}{8}''$ Bolts to a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate that has been previously bent to the shape shown in Fig. 2. The Plate is then bolted to the lugs of the *Magic* Motor, which in turn is bolted to the $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flanged Plate 2. A Driving Band is fixed over the 1″ Pulley on the drum, and round the pulley on the *Magic* Motor. The $\frac{1}{2}''$ loose Pulley 8 is fitted over the winding spindle to prevent the Driving Band from rubbing against it.

Parts required to build the model concrete mixer: 1 of No. 2; 4 of No. 4; 1 of No. 5; 2 of No. 6a; 8 of No. 10; 4 of No. 12; 3 of No. 16; 2 of No. 19b; 4 of No. 20b; 1 of No. 22; 1 of No. 23; 1 of No. 24; 39 of No. 37; 8 of No. 37a; 12 of No. 38; 8 of No. 48a; 1 of No. 51; 1 of No. 52; 1 of No. 62; 4 of No. 111c; 1 of No. 115; 2 of No. 126; 2 of No. 126a; 1 of No. 186; 1 of No. 188; 1 Magic Motor (not included in Outfit).

Model-builders who possess Outfit C, or one that is larger, will find the aircraft carrier shown in Fig. 3 a good subject for their attention. The lower part of the hull consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate, on each side of which two $12\frac{1}{2}''$ Strips 1 and two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plates are fastened by means of Bolts 2 and 3. Further $12\frac{1}{2}''$ Strips are added above these, and the four are bolted together at their free ends by two $\frac{3}{8}''$ Bolts, a Flat Bracket being used for spacing purposes. Flat Brackets are also bolted on each side by the bolts 4. The sides of the hull are extended towards the stern by $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates and $5\frac{1}{2}''$ Strips 5, two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips being used to space them apart. The rounded stern is formed by bolting a curved $5\frac{1}{2}''$ Strip 6 to the $5\frac{1}{2}''$ Strips 5, the Strip 6 overlapping the Strips 5 by two holes. Angle Brackets are then added, and these support two 3″ Pulleys 7 that are held together by a $1\frac{1}{2}''$ Rod pushed through their bosses. Two $2\frac{1}{2}''$ Strips are added as

shown, and a second 5½″ Strip 8 suitably curved, is fixed in position. The forward deck consists of a 5½″ × 1½″ Flexible Plate, across which is bolted a 2½″ × 1½″ Flexible Plate. The deck is held in place by an Angle Bracket bolted to the Flat Trunnion 9, and by a 2½″ × 1½″ Flanged Plate 10.

The flying deck is then constructed. It will be found best to build this as a separate unit and to fix it in place when completed. Otherwise it would be difficult to secure the holding bolts. Two 4½″ Flanged Sector Plates 11 are joined across their narrower ends by two 5½″ Strips, and these overlap four holes on the rear Sector Plate and five holes on the leading Sector Plate. A third 5½″ Strip is joined to the previously mentioned Strips by means of a 1½″ × ½″ Double Angle Strip, which will be referred to again later. The forward part of the flying deck is covered by a 2½″ × 2½″ Flexible Plate extended over the edge of the Flanged Sector Plate 11. To this are bolted two 2½″ small radius Curved Strips joined together by a Flat Bracket. The stern end of the flying deck consists of two 2½″ × 2½″ Flexible Plates overlapping three holes, and bolted to the rear Flanged Sector Plate in the manner illustrated.

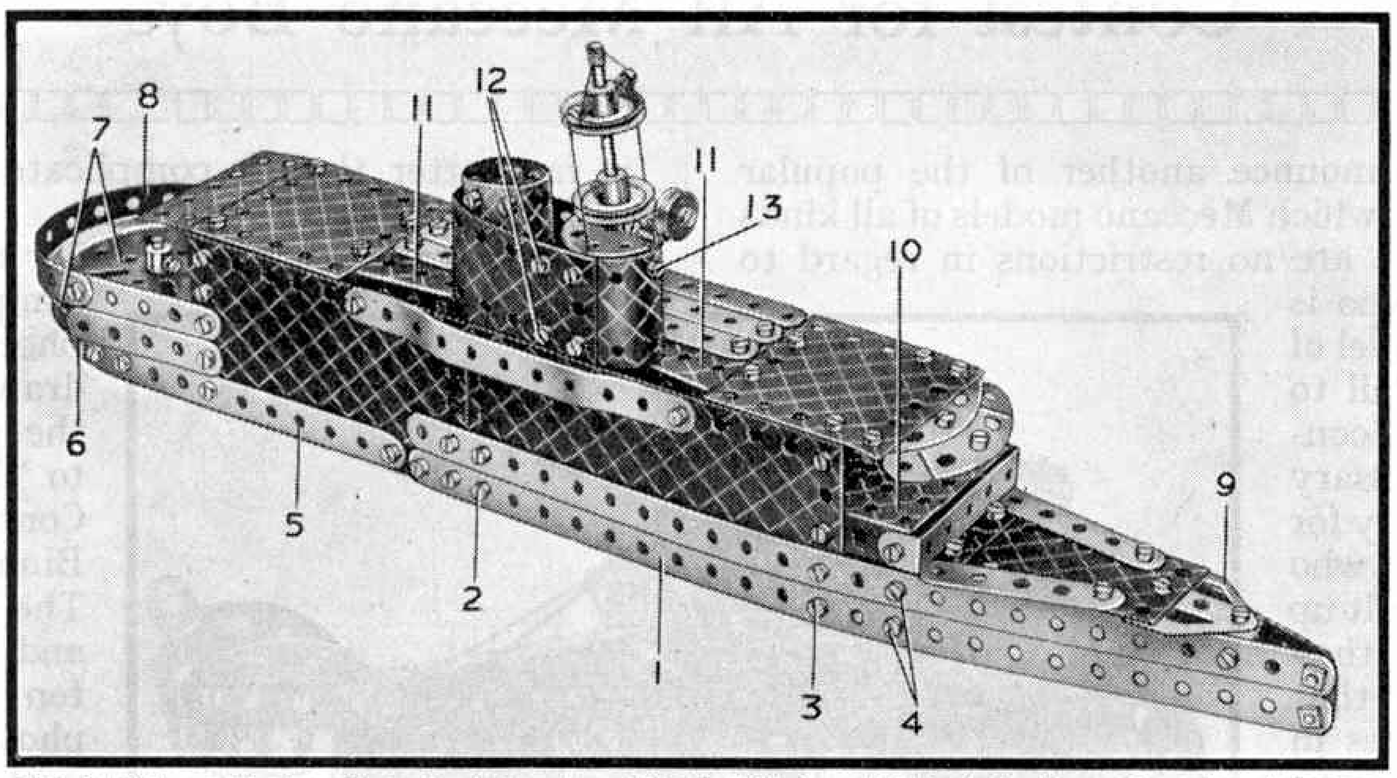


Fig. 3. This model aircraft carrier is based on H.M.S. "Glorious." It includes the main external features of the actual vessel and can be built with Outfit C.

The deck island, which on the actual ship consists of the funnel, wireless masts and bridge, is constructed from 5½″ × 1½″ and 2½″ × 1½″ Flexible Plates curved as shown in the illustration, and then overlapped one hole at each end. A 2½″ Strip is fastened in the position shown by the bolts 12, and serves to hold the deck island to the superstructure. Two 2½″ × 2½″ U-Section Plates overlapped two holes at each end represent the funnel, which is attached to the previously-mentioned 1½″ × ½″ Double Angle Strip. The deck is then ready to be bolted to the hull, and to do this the ends of the 4½″ Flanged Sector Plates 11 are attached to the Strip and Flexible Plates of which the sides of the hull are built. The oval-shaped section consisting of the 5½″ × 2½″ and 2½″ × 1½″ Flexible Plates is fastened to the side of the hull by means of the 2½″ Strip held by the bolts 12.

The mast is a 4″ Rod to which are fastened three 1″ Pulleys and a Bush Wheel. The Bush Wheel is placed between the two lower Pulleys, and is fitted with a searchlight consisting of a ½″ loose Pulley fastened to an Angle Bracket. The complete assembly is held in place by a ⅜″ Bolt 13 that is screwed into the boss of the lower 1″ Pulley.

Parts required to build the model aircraft carrier: 4 of No. 1; 8 of No. 2; 7 of No. 5; 4 of No. 10; 4 of No. 12; 1 of No. 15b; 1 of No. 18a; 2 of No. 19b; 3 of No. 22; 1 of No. 23; 1 of No. 24; 87 of No. 37; 4 of No. 37a; 1 of No. 38; 1 of No. 48; 3 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 2 of No. 90a; 4 of No. 111c; 1 of No. 126a; 1 of No. 176; 2 of No. 188; 2 of No. 89; 3 of No. 190; 2 of No. 191; 2 of No. 195; 2 of No. 199.

An important problem in every town, particularly in large industrial centres, is that of collecting and conveying refuse to the destructor plant. In the old days this work was done with horse-drawn open vehicles, but within the last few years mechanically propelled vehicles fitted with bodies specially designed to prevent the escape of dust into the atmosphere have been introduced for the purpose. In some of these the body, or refuse container, is fitted with tipping mechanism, by means of which the container can be tipped endways to discharge its contents at the plant where it is treated.

A model of a vehicle of this kind in which the container is on rails and is interchangeable is shown in Fig. 4. It can be built with Outfit D. The chassis consists of two 12½″ Angle Girders 1, which are bolted to each edge of a 4½″ Flanged Sector Plate and to a 2½″ × ½″ Double Angle Strip. Two 12½″ Strips are then fastened along the sides of the Flanged Sector Plate and also to the 2½″ × ½″ Double Angle Strip, and a Double Bent Strip is then bolted to the Flanged Plate in the fourth row of holes from the front end, to provide a bearing for a 1½″ Rod that is held in place by Spring Clips.

The driver's cab is best built as a separate unit to be attached to the chassis. A 5½″ × 2½″ Flexible Plate 2 is bolted to the front end of a 4½″ Flanged Sector Plate 3, the latter being sloped upward in the manner shown. A 3½″ Strip bolted to a 2½″ × 2½″ Flexible Plate is then fastened to the Flanged Sector Plate 3 and to the 5½″ × 1½″ Flexible Plate 2. This construction is duplicated on the opposite side of the model, and a 2½″ × 1½″ Flanged Plate is then fixed in place to represent the radiator.

The back of the cab is a 4½″ × 2½″ Flexible Plate, which is held in place by Angle Brackets at the top and bottom. The upper Angle Brackets are connected to the 2½″ × 2½″ U-Section Flexible Plate that forms the roof and which is supported at the front by a 2½″ × ½″ Double Angle Strip. When the completed cab is fixed in position on the chassis, the radiator is held in place by an Angle Bracket.

The rear axle is supported on two Trunnions 4, and Flat Trunnions 5 are bolted in the positions shown to support the Rod on which the tipping mechanism is pivoted.

The tipping mechanism consists of two pairs of 5½″ Strips fastened together by means of bolts and Angle Brackets, to form angle girders. These are connected together by the 2½″ Strip 7 and the 2½″ × ½″ Double Angle Strip 8. A 1½″ Strip is placed across the two Angle Girders 1 and secured to the 5″ Rod 9, which is held in position by Spring Clips. This Rod passes through the centre hole in the 2½″ Strip 7. The 2½″ × ½″ Double Angle Strip 8, is pivoted on a 3½″ Rod that is pushed through the Flat Trunnions 5. The container is tipped by moving the Crank Handle 10, which operates a Crank and 2½″ Strip as shown, both of these being lock-nutted together and to the 5½″ Strip.

The front wheels are mounted on a 4½″ Rod, and the rear wheels on a 4″ Rod, side play in the axles being prevented by means of Spring Clips.

The steering mechanism, which is not shown in the illustration, is constructed by fastening a Bush Wheel to a 2½″ × ½″ Double Angle Strip by means of two bolts, to one of which a 2½″ Strip is pivotally attached. To the other end of this Strip a Crank is lock-nutted, and in its boss is journalled a 3½″ Rod, that holds the 1″ Pulley 6.

The container consists of two 5½″ × 2½″ Strip Plates and two 2½″ × 2½″ Flexible Plates bolted to a 5½″ × 2½″ Flanged Plate. The method of fixing the wheel axle supports is not shown in the illustration but it is quite simple. The rear support consists of two 1″ × 1″ Angle Brackets overlapped one hole and bolted to the underside of the truck. A 1½″ × ½″ Double Angle Strip, which is extended by Flat Brackets and is pivotally attached to the bottom of the truck, supports the front wheels. If a *Magic* Motor is available it may be used to drive the model. The Motor may be fixed in position by bolting it to the Angle Girders 1.

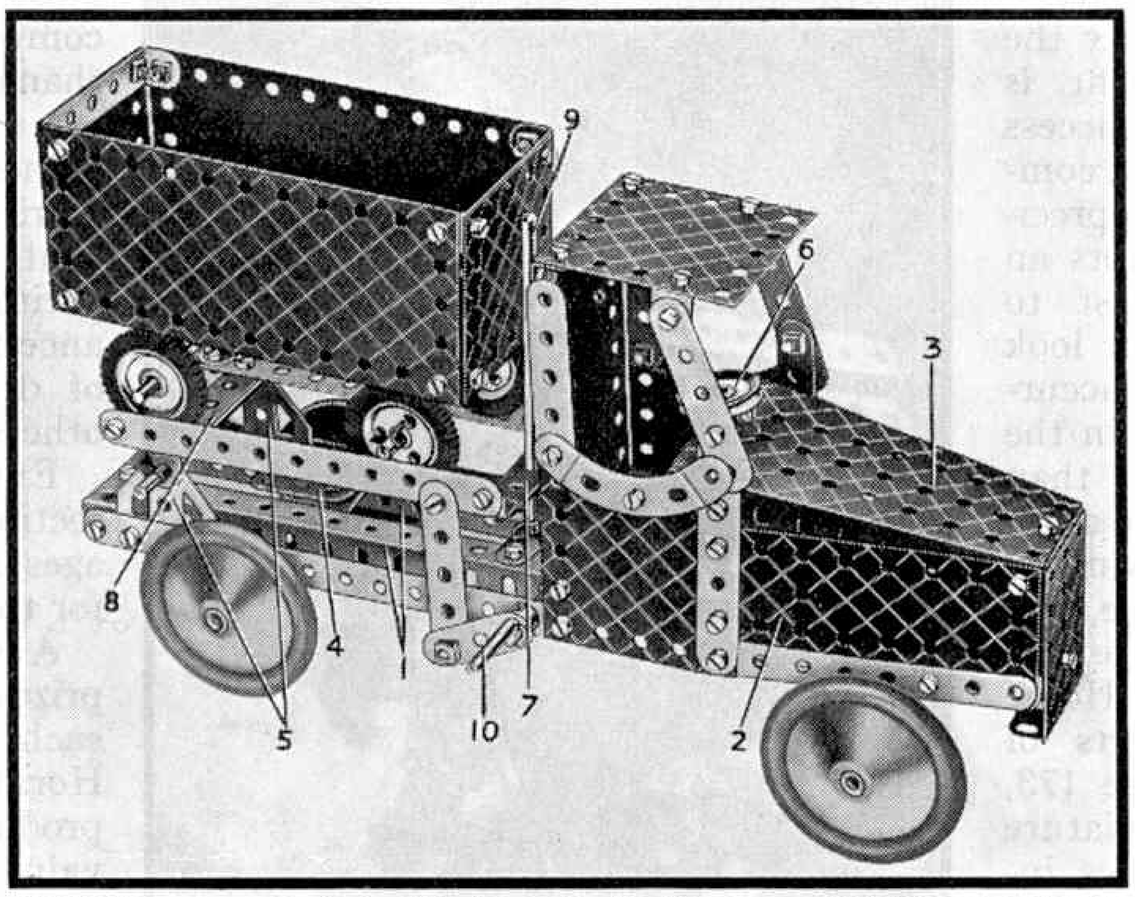


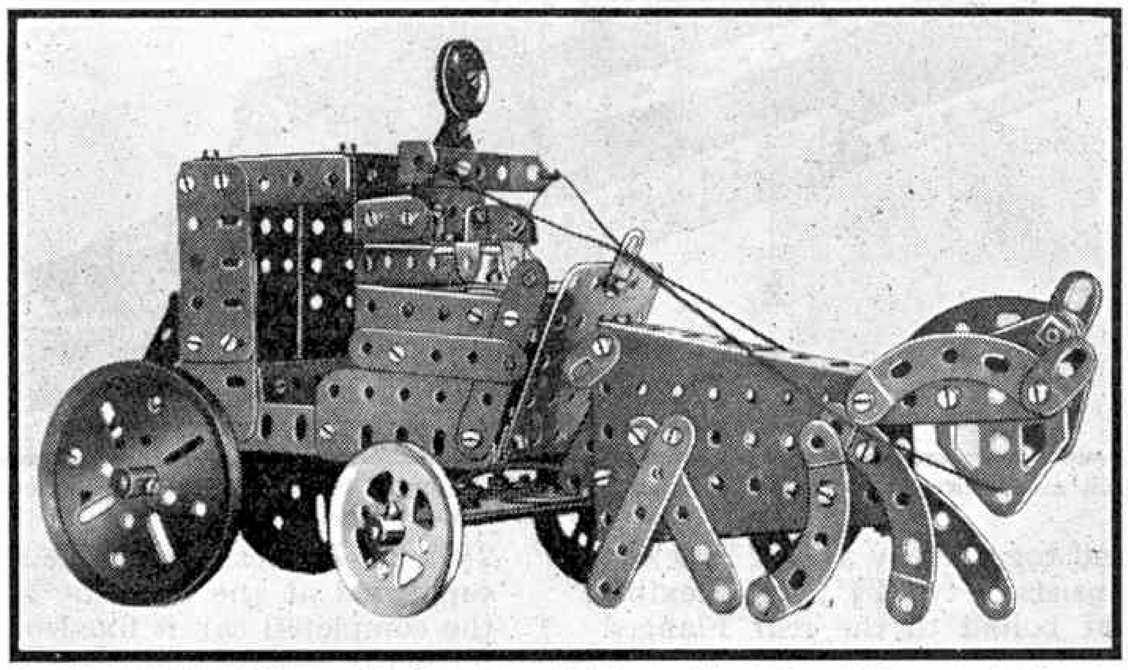
Fig. 4. This refuse collecting vehicle is a good subject for owners of Outfit D or one larger. It includes mechanism for tipping the refuse container endways to discharge its contents.

Parts required to build model refuse remover: 2 of No. 1; 4 of No. 2; 2 of No. 3; 7 of No. 5; 1 of No. 6a; 2 of No. 8; 2 of No. 10; 9 of No. 12; 2 of No. 12a; 1 of No. 15; 1 of No. 15a; 2 of No. 15b; 3 of No. 16; 1 of No. 17; 1 of No. 19s; 3 of No. 22; 2 of No. 22a; 1 of No. 24; 83 of No. 37; 8 of No. 37a; 12 of No. 38; 1 of No. 45; 1 of No. 48; 6 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 54a; 2 of No. 62; 2 of No. 90a; 3 of No. 111c; 2 of No. 126; 2 of No. 126a; 4 of No. 187; 2 of No. 189; 4 of No. 190; 1 of No. 191; 2 of No. 195; 1 of No. 199; 4 1″ Rubber Tyres (not included in Outfit).

A General Model-Building Competition

Contest for All Meccano Boys

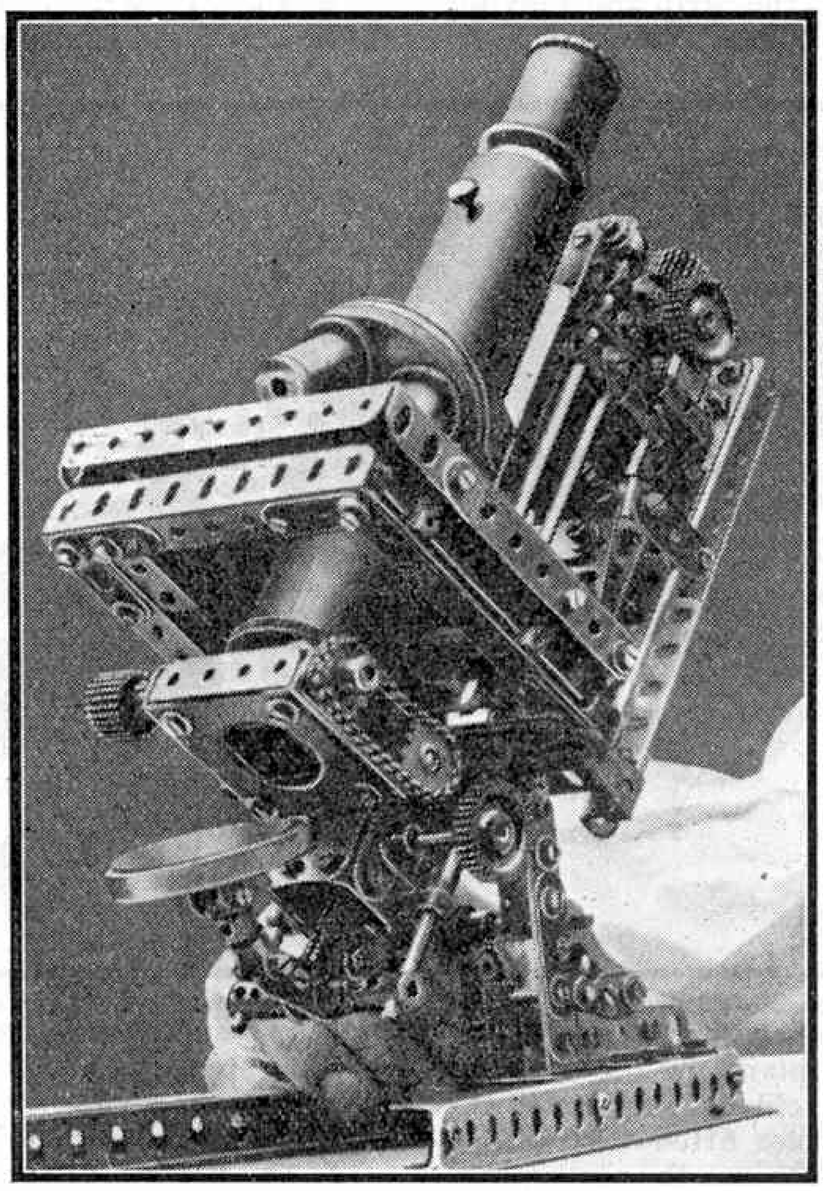
On this page we announce another of the popular general competitions in which Meccano models of all kinds may be entered. There are no restrictions in regard to size, and any reader who is building a Meccano model of any kind should not fail to enter it in this month's contest. It is not even necessary to build a model specially for this contest. Readers who have models already built up may submit these if they wish, but no models that have already won prizes in previous "*M.M.*" competitions are eligible.



Novelty and simplicity are the keynotes of this model coach and horses, which was built by G. Swain, Waikato, North Island, New Zealand. The model was awarded Third Prize in the "September" Model-Building Contest.

It should be the aim of every Meccano boy to take part in each of the Model-Building Competitions announced in the "*M.M.*," for they afford a valuable opportunity of measuring his model-building ability with that of his fellow Meccano boys, and the experience gained by working in competition with others will broaden the competitor's outlook. This simple contest, in which entrants can make free choice of subject provides an excellent opportunity for new readers to make a start.

Many readers are still under the impression that a big Outfit is needed in order to achieve success in "*M.M.*" Contests. This is completely wrong. The judges appreciate the enterprise that prompts an ambitious Meccano enthusiast to embark on a big scheme, but look for originality, neatness and accuracy of construction and skill in the use of Meccano parts rather than mere size. This is shown by the number of simple models that win the principal prizes. For example, the entry to which the First Prize was awarded in our September "Home Objects" Contest, the results of which are announced on page 173, consisted of a set of miniature furniture. Each of the articles included in the set is very simple in design, and the chief merit of the entry is to be found in neat construction, realistic appearance, and the manner in which pleasing proportions have been maintained.



A typical example of the practical value of Meccano. This fine microscope won First Prize in the September Competition and was built by J. M. Platero, Paris.

Another example of a simple model that gained a big prize is shown in the upper illustration on this page. Good working models, driven by a clockwork or electric motor, also appeal to the judges, but again a neat and effective movement of a simple kind is far better than a complicated one that is liable to be uncertain.

All that is necessary in order to enter a model in this competition is to have it photographed, or make a drawing of it, and then send the photograph or drawing to "March" Model-Building Contest, Meccano Ltd., Binns Road, Liverpool 13. The competitor's age, name and address should be written on the back of each photograph or drawing submitted.

Readers whose models incorporate special features not clearly shown in the photographs or drawings should write a short description that will make everything clear to the judges, and enclose this with their entries. The description should be as brief and concise as possible, and there is no need to explain every detail of the model.

Readers of all ages are eligible to enter this competition and if they wish may send in more than one entry, provided all are enclosed in the same envelope. No competitor will be awarded more than one prize, and if several models are sent they will be grouped together and judged on their joint merits. All models submitted in the contest must be the work of competitors themselves without assistance from anyone, but photographs of drawings may be prepared by others.

Entries will be divided into two sections: A, for competitors of all ages living in the British Isles, and B, for those of all ages living Overseas.

A separate and complete set of prizes as follows will be awarded in each Section: 1st, Meccano or Hornby products value £3/3/–. 2nd, products value £2/2/–. 3rd, products value £1/1/–. There will be also five prizes of products value 10/6 and a number of consolation awards in each section. Readers who are successful in winning prizes will be allowed to make their own selections of products to the value of their awards from current Meccano and Hornby Train price lists. Competitors who live in the British Isles and enter Section A should post their entries in time to reach Liverpool on or before 31st March, 1937. Overseas competitors have an extension of time until 31st May.

Model-Building Competition Results

By "Spanner"

September Contests (Home and Overseas)

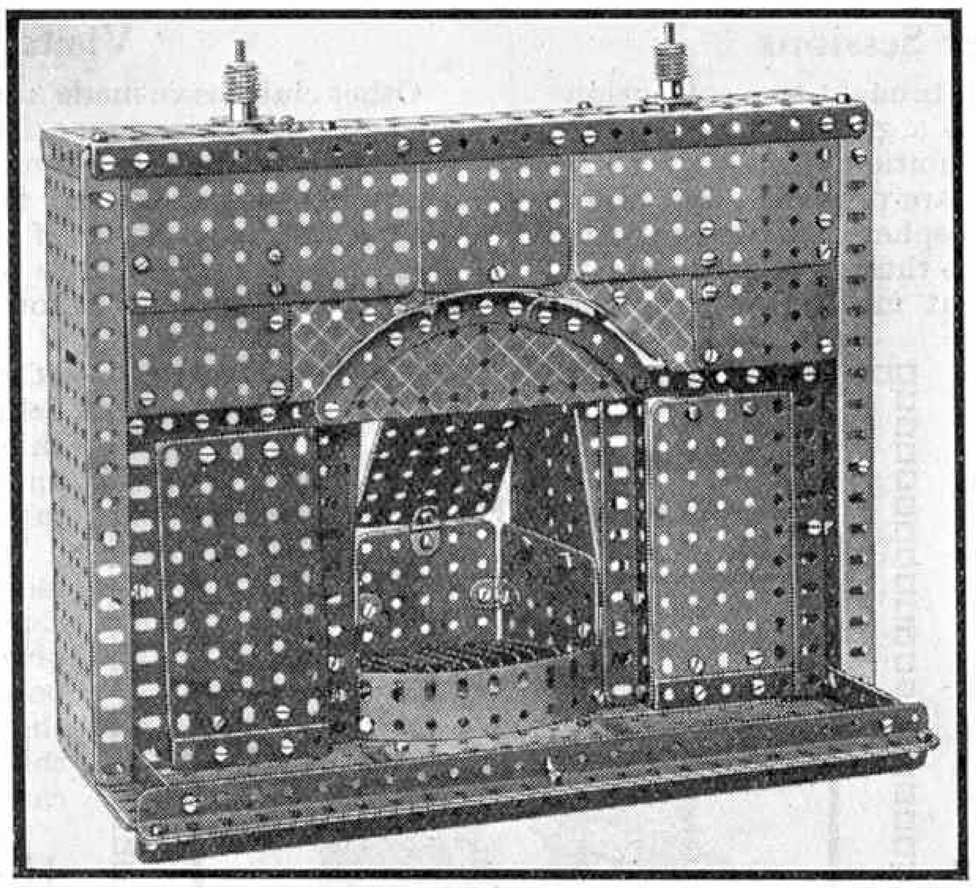
"Familiar Home Objects" Competition (Home)

1ST PRIZE, Meccano or Hornby products value £3/3/–: A. Spring, Cainscross, Nr. Stroud. 2ND, products value £2/2/–: J. Pearson, Heywood, Lancs. 3RD, products value £1/1/–: G. Overton, Hull.

Products value 5/–: F. Hilton, Cowes, I.O.W.; C. Williams, Manchester; W. Goodman, Allestree, Nr. Derby; K. Sides, Richmond, Surrey; E. Clements, Farnborough.

A group of miniature furniture comprised the entry submitted by A. Spring, who was awarded the First Prize. The main pieces are a sideboard, table, two chairs, and a cabinet gramophone, and in addition there are a fireplace, various ornaments and cushions on the chairs. The cushions are formed with Boiler Ends; they look realistic, but I am afraid they would be rather uncomfortable in use.

All the items included in the group are very simple in construction. The table is built of a Flanged Plate supported on vertical Strips, and its legs are braced with 1" Double Angle Strips. The dining chairs have Strips for the legs, Curved Strips for the sides of the back, and a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate for the seat. A novel item is a bowl of flowers on the table. The bowl is a 1" loose Pulley fitted with a Rubber Tyre, and Collars inserted in the rim of the Pulley represent flowers floating in water. A reading lamp has a $\frac{1}{2}''$ loose Pulley for the base and a Triangular Plate for the shade, and a smoker's ash tray is built up from a Contrate Wheel, a Rod and a small Flanged Wheel.



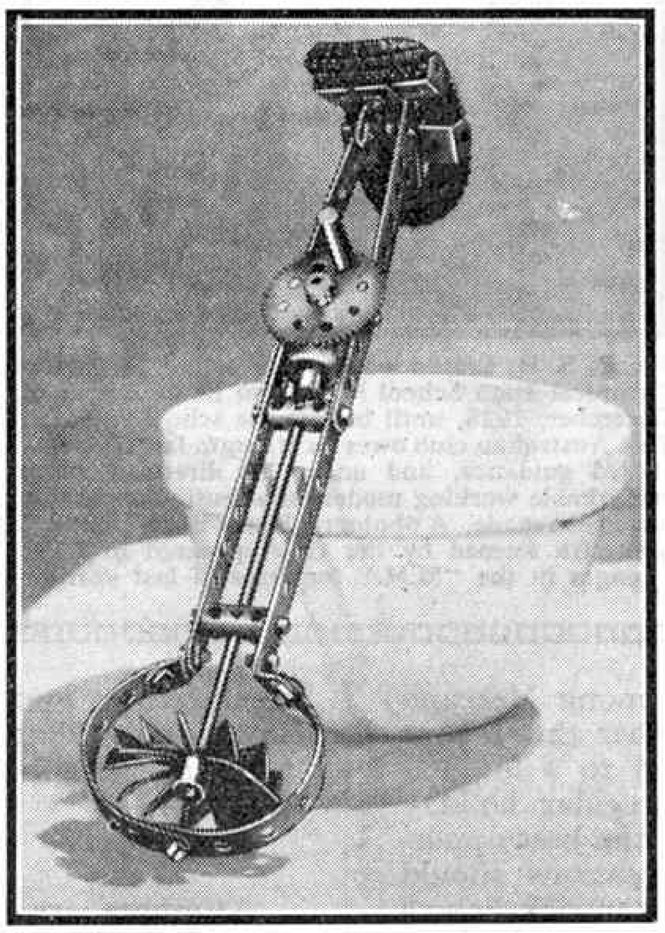
A realistic model fireplace that won Second Prize for J. Pearson, Heywood, in the September "Familiar Home Objects" Competition.

Second Prize was awarded for the model fireplace shown in the upper illustration on this page. It was built by J. Pearson, and is constructed mainly of Flat Plates. The hearth is particularly realistic, and novelty is introduced by the provision of two ornaments, consisting of Worms mounted on Rods with Pulleys for bases.

An equally familiar home object, but one that many model-builders would overlook, formed the subject of the Third Prize model. It is the egg whisk that is shown in the lower illustration on this page. Its constructional details are shown in the illustration, and I have no doubt that such a model could be put to practical use.

E. D. Clements submitted a model of the bathroom at his home, one wall and the ceiling being excluded so that the interior can be seen. Inside the room is a bath and pedestal wash basin, mirrors, clothes hooks and gas heater. The bath and wash basin are fitted with taps and water and waste pipes. A window is provided in one wall of the room, and the door is hinged so that it may be opened and closed. With the exception of curtains for the windows and the glass of the mirrors, the model is constructed entirely of Meccano parts.

K. Sides submitted a model of a modern dining table. The table top is made of Flanged Plates, which are supported on a frame of Flat Girders, and this in turn is mounted on two end supports that rise from a rigidly constructed base. On the table is a "runner" made up of lengths of Sprocket Chain, and there is also a vase of flowers. The vase consists of a small Contrate Wheel, a $\frac{3}{4}''$ diameter $\frac{3}{4}''$ face Pinion Wheel, three 1" loose Pulleys, and a Chimney Adaptor mounted on a Rod. The stems of the flowers are pieces of wire and the flowers themselves are represented by nuts, each of which is fitted with a Grub Screw.



This prize-winning working model of an egg whisk is the work of G. Overton, Hull.

"General" Competition (Overseas)

1ST PRIZE, Meccano or Hornby products value £3/3/–: J. Merce Platero, Paris. 2ND, products value £2/2/–: M. Cornioley, Geneva. 3RD, products value £1/1/–: G. Swain, Waikato, North Island, New Zealand.

Products value 10/6: J. Rowston, Orange, New South Wales; E. Bowgaultesv, Táo-Nan Catholic Mission, Manchoukuo.

Products value 5/–: L. Linder, Stockholm; R. Harrington, Umtali, S. Rhodesia; A. Spafford, Sherbrooke, Canada; M. Heyne, Veur, Holland; J. Davies, Montreal.

In this contest competitors were allowed free choice of subjects for their models and many interesting entries were received. The most outstanding was that submitted by J. Merce Platero, who made the fine microscope illustrated on page 172. Considerable ingenuity has been shown in the construction of this model, and among its many fine features are a rack mechanism for coarse focusing and a micrometer screw adjustment to the eyepiece for fine focusing. There is also a condenser and an adjustable mirror for illuminating the object under examination.

With the exception of the optical equipment, the microscope is made from Meccano parts, and I feel quite sure that it is as efficient in service as it is realistic in appearance.

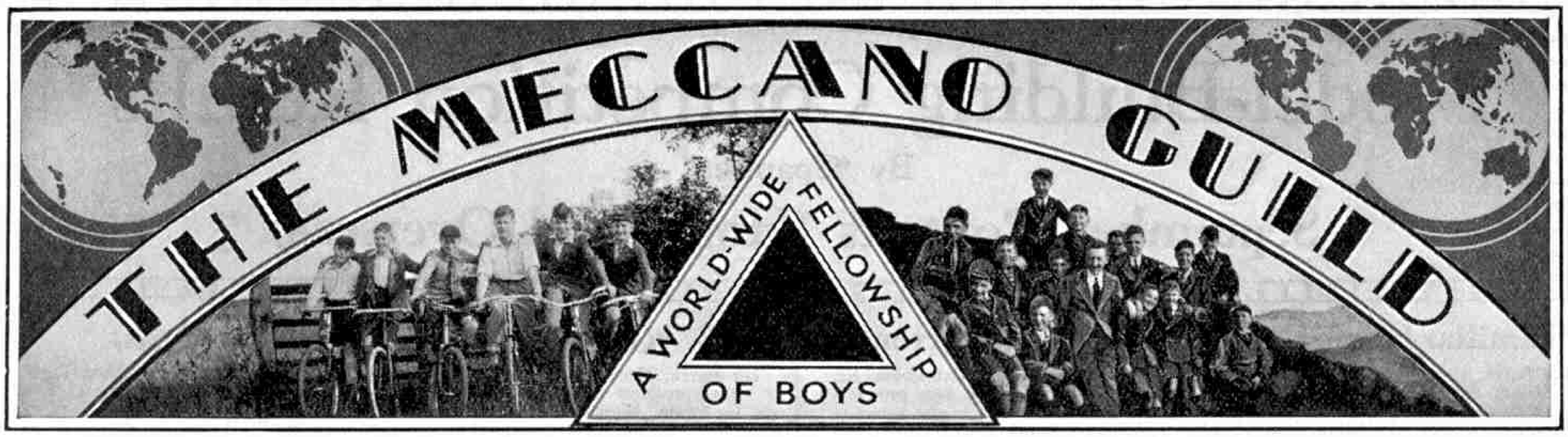
A model of a more usual type, and one that possesses greater interest to the ordinary model-builder, is a fire-engine and escape built by Marcel Cornioley. The engine is remarkable for the wealth of detail work that it incorporates, and it was chiefly on this account that it was awarded Second Prize, for there are no novel or outstanding features in its design or construction.

Novelty is the chief feature of the model that won Third Prize. This is a reproduction of a five-passenger coach of the kind used for travel in the Australian bush, where passengers are few and far between. The model is the work of Grant Swain, and as its constructional details no doubt will be of interest to other model-builders I am illustrating it on the opposite page.

A vertical steam engine and boiler that is driven by an Electric Motor was sent by J. Rowston of Orange, New South Wales. A special feature of the model is a governing device that enables the driving motor to run at constant speed irrespective of the load on the engine. Mounted inside the boiler is a buzzer, which is used to imitate the noise made when the safety valves of a real boiler "blow off."

From far-away Manchoukuo came a group of entries from native boys at the Catholic Mission, Táo-Nan. The best of these models are a hammerhead crane and a cantilever bridge, and although very few parts have been used in the construction of these, good workmanship has resulted in a strong and sturdy appearance. I hope the success of these Meccano enthusiasts in this contest will encourage them to enter future competitions, and that they will be successful in winning further prizes.

One of the engineering accomplishments of 1936 was the completion of the Birchenough arch bridge over the Sabi River in Southern Rhodesia. This bridge formed the subject for a large model submitted by R. Harrington of Umtali, Southern Rhodesia. The length of the span in this excellent reproduction is 10 ft., and the highest point of the steelwork is 2 ft. 6 in. above the level of the roadway. The arch is formed with $9\frac{1}{2}''$ Angle Girders, and the roadway consists of strips of wood.



Winding Up the Winter Sessions

In most clubs the second winter session is brought to a conclusion by an Exhibition or a Social that provides a grand climax to the activities of the indoor months. An Exhibition usually is most satisfactory, especially when refreshments are provided, and other means adopted to encourage a friendly atmosphere. On the one hand it gives splendid opportunities of showing to those who are interested what the members have been doing at meetings during the winter, and on the other nothing is more satisfactory to members themselves than an opportunity of demonstrating their skill and efficiency in their chosen hobby. In any case an opportunity should be made for explaining briefly something of the aims and objects of the Guild and club movement to those who are invited to be present.

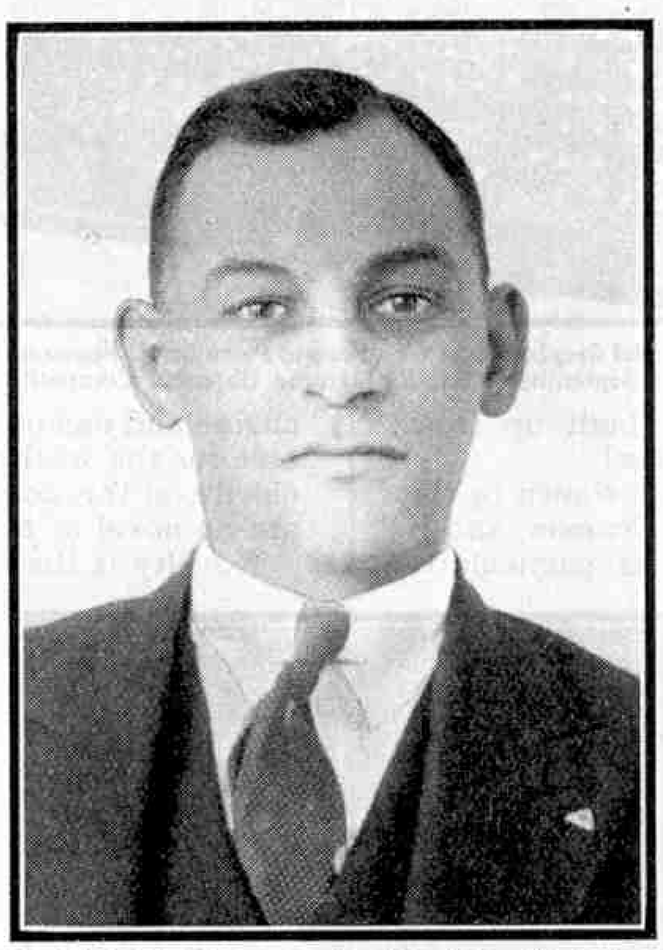
Another event that should not be overlooked is the presentation of prizes won in club competitions and of Merit Medallions. To win a Merit Medallion is the aim of every Meccano boy, for it represents the highest possible achievement in Guild and club work, and now is the time for Leaders to let me know whom they wish to nominate for the awards for the present session, so that I can have the Medallions engraved in readiness for presentation. There are no restrictions in regard to the character of the work that qualifies for this important award, provided that it has helped in some way to enhance the reputation of the club. It is a suitable reward for meritorious model-building, successful recruiting and good service in an official position, but Leaders should not overlook the efforts of ordinary members, who are not perhaps closely concerned in the official business of running the club, but who by their example and never-failing cheerfulness help to maintain the true Guild spirit.

Looking Ahead

With the passing of the winter sessions comes preparation for the outdoor season. It is not too early to begin to make arrangements, for members are best held together during the spring and summer when they are made to realise in advance that those in authority are making definite plans for interesting and enjoyable times. It is the rule among Meccano clubs to continue their work in one form or another throughout the summer. The programme is not now confined to a few excursions, for there are many clubs in which a regular holiday party of some kind is arranged. School clubs have the best opportunities in this respect. Leaders of these organisations should always keep in mind the example of the Mary Swanwick School (Chesterfield) M.C., the members of which profited greatly from what may be called a communal holiday spent at Tenby, in South Wales, with their Leader in charge. There the members played games and bathed in the sea to their hearts' content, and in addition they visited many places of historic and general interest in the neighbourhood. The healthy outdoor life benefited all who took part, and the varied programme carried out provided something of interest for each member.

Meccano Club Leaders

No. 88. Mr. E. S. H. Gibson, M.Sc.



Mr. E. S. H. Gibson was Leader of the Thebarton Technical High School M.C. from its affiliation in December, 1928, until he left the school recently. This Australian club owes its strength largely to his skilled guidance, and under his direction many remarkable working models of scientific apparatus have been made. A photograph of a novel "bottle" orchestra formed by the club appeared in these pages in the "M.M." for June of last year.

Visits to Meccanoland

Other clubs have made a practice of arranging a visit to Meccanoland during the summer. This is an ideal plan, for nothing could give a greater thrill to members of the Guild than to visit its Headquarters, and to see the factory in which Meccano and Hornby Trains are made. Visits of this kind are always welcome, and all I ask is that ample notice should be given, so that I can make adequate arrangements for guides, and plan out a profitable tour of the docks, the overhead railway and other Merseyside attractions. I shall be delighted to hear from any Leader who is thinking of visiting Liverpool this summer, and to advise him in regard to the necessary arrangements.

I would mention that in order to enable me to make proper arrangements for the reception of the party, the Leader must give at least four weeks' notice of a proposed visit to the factory. In addition, the number of members who are to form the party should be stated, and in no case must the stated number be exceeded.

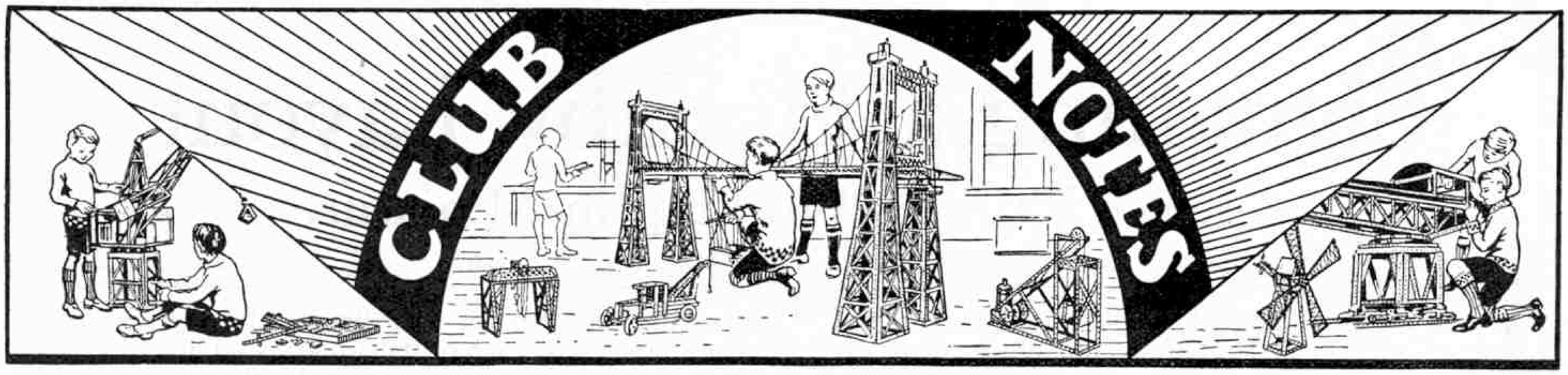
How New Clubs Make Progress

During the past few months there has been an increase in the number of clubs, founded by a few enthusiasts, that have not yet been able to secure affiliation. In some cases this is because of difficulty in finding a Leader, and in others because a club room cannot be obtained. I have only one word of advice for the officials of such clubs, and that is to persevere. Other clubs that are now well-known and vigorous encountered similar difficulties in their early days, and what they have done can be done again. In the meantime members can continue to enjoy their model-building together, and to arrange festivities and excursions. If they are keen and enthusiastic others will join them, and they will soon find themselves in a position to apply for affiliation. I will do all I can to help them. One way is by including reports in the Guild pages of the *"M.M.,"* a sure way of increasing membership, and I shall do this whenever any interesting news reaches me. The *"M.M."* is read by many thousands of Meccano boys who do not yet belong to any club, and also by their fathers and other grown-up people, some of whom probably would be willing to act as Leaders of clubs and thus support them in the good work they are doing.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:

BIRMINGHAM—R. Gough, 18, Dudley Park Road, Acocks Green.
BIRMINGHAM—S. Millard, 142, Ash Road, Saltley, 8.
DUBLIN—A. Gourley, 15, St. Kevins Gardens, Dartry.
LIVERPOOL—Mr. G. Livingstone, 15, Aldale Close, Carr Lane, 11.
LONDON—J. Smoolovitch, 62, Settles Street, Commercial Road, E.1.
SLEAFORD—J. H. Aram, 1, North Parade, Sleaford.



St. Stephens (Saltash) M.C.—Enthusiasm for model-building continues, and at one meeting the members combined to build a splendid model of a ship. Model aeroplane construction is also very popular, and some good scale models are in hand. Games have been played at several meetings. Club roll: 6. *Secretary:* B. Braund, 9, Homer Park, Saltash.

Todmorden Road Central School (Burnley) M.C.—A debate on "*Walking v. Cycling*" was warmly contested, and was finally decided in favour of walking. A Lantern Lecture on "*Cocoa and Chocolate*," proved exceedingly interesting, and was listened to by an audience that included members and friends. A Visit to the local Gas Works was greatly enjoyed. An Exhibition has been held, and many attractive models were displayed. Club roll: 24. *Secretary:* L. Hinton, 4, Thirlmere Avenue, Burnley.

Barnard Castle School M.C.—The first Annual Exhibition proved very successful, and did much to make the club better known in the school. The many items of special interest included a Meccano model of flying aeroplanes, and a "Hornby Puzzle" devised and operated by the Hornby Section. This Section has been very busy, and is endeavouring to make up for time lost during the summer terms last year. Club roll: 15. *Secretary:* S. W. Telfer, The School, Barnard Castle, Co. Durham.

Regent Street Central School (Heywood) M.C.—A Lecture that was especially interesting dealt with "*A Trip to the Holy Land*," and many of the slides shown were photographs taken at the places where Biblical incidents occurred. An Exhibition has been held, and the many models included the Tower Bridge, a railway breakdown crane, electric tram car, windmill, and a patent weighing machine. The girl members staged an excellent display of needlework. After the Exhibition a Concert was given by the members. A small charge was made for admission, and the club funds benefited by over 25/-. Club roll: 150. *Secretary:* R. Lunn, 14, Pickup Street, Heywood, Lancs.

Wheelwright Grammar School (Dewsbury) M.C.—Attendance has been rather low, but the enthusiasm of those who have taken part in the club programme has resulted in some very enjoyable meetings. A Film Show proved so successful that another one is being arranged in conjunction with an Exhibition. Club roll: 12. *Secretary:* T. McDonald, 180, Staincliffe Road, Dewsbury, Yorks.

Holy Trinity (Barnsbury) M.C.—The work of the first winter session culminated in the Annual Exhibition, which was a great success. The models were judged by a representative of Meccano Ltd., who was impressed by the high quality of the display. A very enjoyable Social concluded the session. Club roll: 20. *Secretary:* H. C. Boyd, 12, Stonefield Mansions, Cloudesley Square, London, N.1.

Exeter M.C.—As usual, the range of Meccano models constructed during recent meetings has been remarkably varied, and has included windmills, aeroplanes and churches, a dynasphere, switchback and a telephone. Model ships of many types have been constructed, and special attention is now being given to aeroplanes. Several members were included in a school party that visited Milley's Engineering Works, Exeter, and the tour gave them many new ideas for Meccano models of machinery. The weekly story reading continues to be very popular, and the story of the club itself occupied two recent readings. Club roll: 40. *Secretary:* E. Ashwood, 188, Pinhoe Road, Exeter.

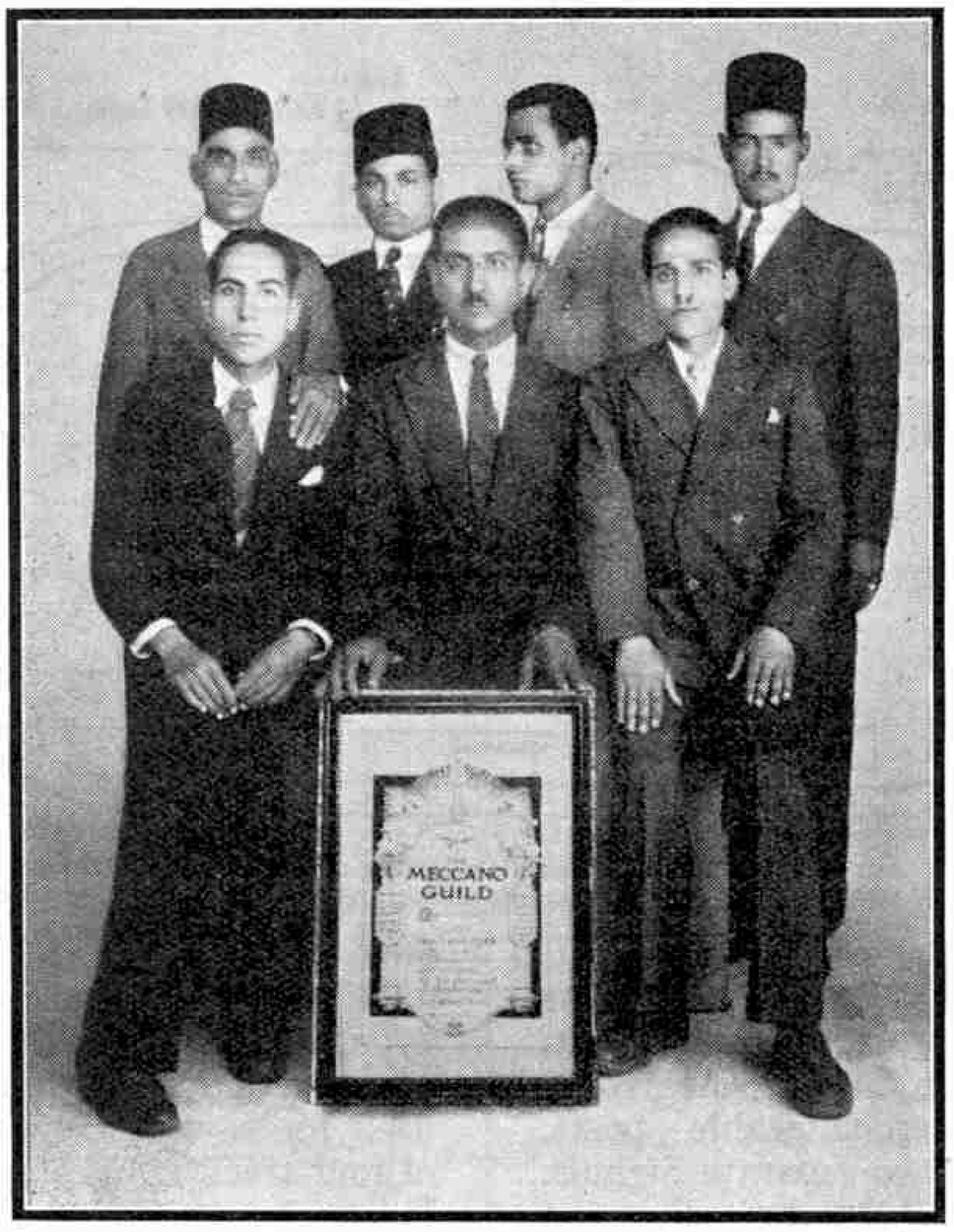
Bristol Grammar School M.C.—The members are very enthusiastic, and considerable model-building has been accomplished. Outstanding models have been a large derrick crane and a speed controller and indicator. Club roll: 15. *Secretary:* L. C. Stear, "Highbank," Trelawney Road, Cotham, Bristol, 6.

Cold Harbour M.C.—Model-building continues to be the chief interest of the members, and some good work has been carried out. Several attractive Lantern Lectures have been arranged. Club roll: 11. *Secretary:* R. S. Hill, Anstie Farm, Holmwood, Surrey.

Bryntirion M.C.—A very successful Exhibition has been held, and the many large models displayed included one of the Quebec Bridge, several types of cranes and guns, and a breakdown lorry. There were also small models of such unusual subjects as a crocodile, dog, and violin. The Exhibition was praised by the masters of the school, and another probably will be held this session. Club roll: 13. *Secretary:* P. Parry, Ar-y-Bryn, Penllwyn Park, Carmarthen.

Sutton Valence Council School M.C.—The varied programme being carried out this session includes a Model-building competition, a conjuring display, chemistry experiments and a Mystery Night. Games and football matches played against the rest of the school are very popular. Club roll: 20. *Secretary:* J. Chandler, "Herriard," Chart Sutton, Nr. Maidstone.

Islington M.C.—Excellent Meccano models have been built, and some time has also been spent in woodworking and in making tunnels for the Islington H.R.C. Branch. A Visit to the L.M.S.R. Camden railway sheds was greatly enjoyed. Members are to be given opportunities to help in the government of the club, by being encouraged to make practical suggestions, which will be carefully considered. Club roll: 15. *Secretary:* K. V. Dines, 70, Thornhill Road, Barnsbury, N.1.



The officials of the Cairo M.C. Mr. M. F. Awad, the Leader, is on the right of the front row, and Mr. M. K. Salem, the secretary, is on the left. This enthusiastic and industrious club was affiliated in January 1935, and its membership is increasing steadily. Model-building is the chief feature of indoor meetings, and visits to places of interest form a large part of the outdoor programme.

Wednesbury M.C.—The club's first Exhibition was a great success. It was a three-day event, and was officially opened by Mr. A. B. Turner, M.A., B.Sc., the club President. The attendance was very good, and the visitors on the third day included a party from the Kidderminster Model Railway Club. Outstanding among the numerous splendid Meccano models built by the members were a super model transporter bridge, a workshop operated and lit electrically, a swing-boat, and a model theatre electrically lit and complete with dance orchestra. The Fretwork Section also had a good show, and practically all articles for sale were sold. Visitors were particularly interested in the Model Railway Section, where an excellent layout was demonstrated. A small party recently visited the Walsall Corporation Gas Works. Club roll: 32. *Secretary*. A. L. Morgan, 17, Cobden Street, Fallings Heath, Wednesbury.

Mail School M.C.—Meetings have been pleasantly varied, and activities have included a Treasure Hunt, Film Show, General Knowledge tests, and the reading of ghost stories. Club roll: 28. *Secretary:* D. Rubin, Mendip Lodge, 33, Clifden Road, Twickenham.

AUSTRALIA

Maylands M.C.—The club participated in a Church Fair at Subiaco. The exhibits included a meccanograph, clock, roundabout, and "Pacific" tank Locomotive. Some of the members competed in a Meccano Model-building Contest at the Fair, and the first and second prizes went to the club. A very interesting Lecture on "*Aeroplanes*" has been given by Mr. Roberts, of the Maylands Aerodrome. A Visit has been paid to the Pascomis milk depot, where the party saw milk being pasteurised and tested. Games and the reading of serial stories have been among the lighter activities. Club roll: 35. *Secretary:* M. Thomson, 13, Kennedy Street, Maylands, W.A.

Thebarton Junior Technical School M.C.—Very interesting Lantern Lectures have dealt with "*Ships*" and "*Aeroplanes*," and an enjoyable Lecture has been given on "*Sea Life*." In a Hobbies Competition the first prize was awarded to the builder of a model aeroplane, and the second prize was earned by an automatic weighing machine. Club roll: 50. *Secretary:* K. K. Knuckery, 59, Moseley Street, Glenelg, S.A.

EGYPT

Cairo M.C.—This club is making excellent progress. There are Sections for Model-building, Stamp Collecting, Finance, and Games. A very interesting Lecture on "*The Old History of Egypt*" has been given by Professor Mohamed Fahmy Awad, of the St. Helen College. A visit has been paid to the Almaza Airport, near Cairo, and the members were permitted to inspect at close quarters the many modern types of aircraft there. Club roll: 25. *Secretary:* Mohed Kamel Salem, 14, Bibars Street, Cairo.

Zagazig M.C.—An interesting Talk by the President on "*Aviation in Egypt*" was much enjoyed. At one meeting a member described his recent holiday at Luxor. The club has been occupied chiefly with a sports and games contest against the Zagazig National Sporting Club. The events included football, running, jumping and throwing, and the Zagazig M.C. won with a total of 188.5 points against 173.5 for the Sporting Club. During an interesting Visit to a local Printing Works, the party saw admission cards and programmes in connection with the club's Christmas and New Year celebrations being printed. Every process carried out at the Works was explained to the party. Club roll: 20. *Secretary:* Miss B. Mangourie, 396, Gannabiet Sikka Hadid Avenue, Zagazig.

INDIA

Ranjit M.C.—Model-building has been the main interest of members, and some excellent models have been completed, including a medical induction coil from which much enjoyment was derived. The Library is increasing, and good use is made of it by the members. During the Christmas holidays a party of 12 members went on a tour from Lahore to Calcutta. Among the many places visited was an Exhibition at Lucknow, to which the club have promised to send two or three models for display. Club roll: 20. *Secretary:* S. Harbhajan, 689, Krishna Bazar, Gowal Mandi, Lahore.

SOUTH AFRICA

Berea M.C.—New members have been enrolled, and excellent progress is being made. Outdoor activities have included Tennis and a Treasure Hunt. Games have been played at several indoor meetings. Club roll: 15. *Secretary:* L. Michelow, 74, Hillbrow Street, Berea, Johannesburg.

Continental (Capetown) M.C.—There has been considerable model-building activity, and in a speed competition the winner completed his model in 40 min. Stamp Collecting is a flourishing hobby in the club. Members are busy constructing a laboratory in which to carry out chemical experiments. Club roll: 6. *Secretary:* A. Jansen, 5, Robinson Street, Capetown.

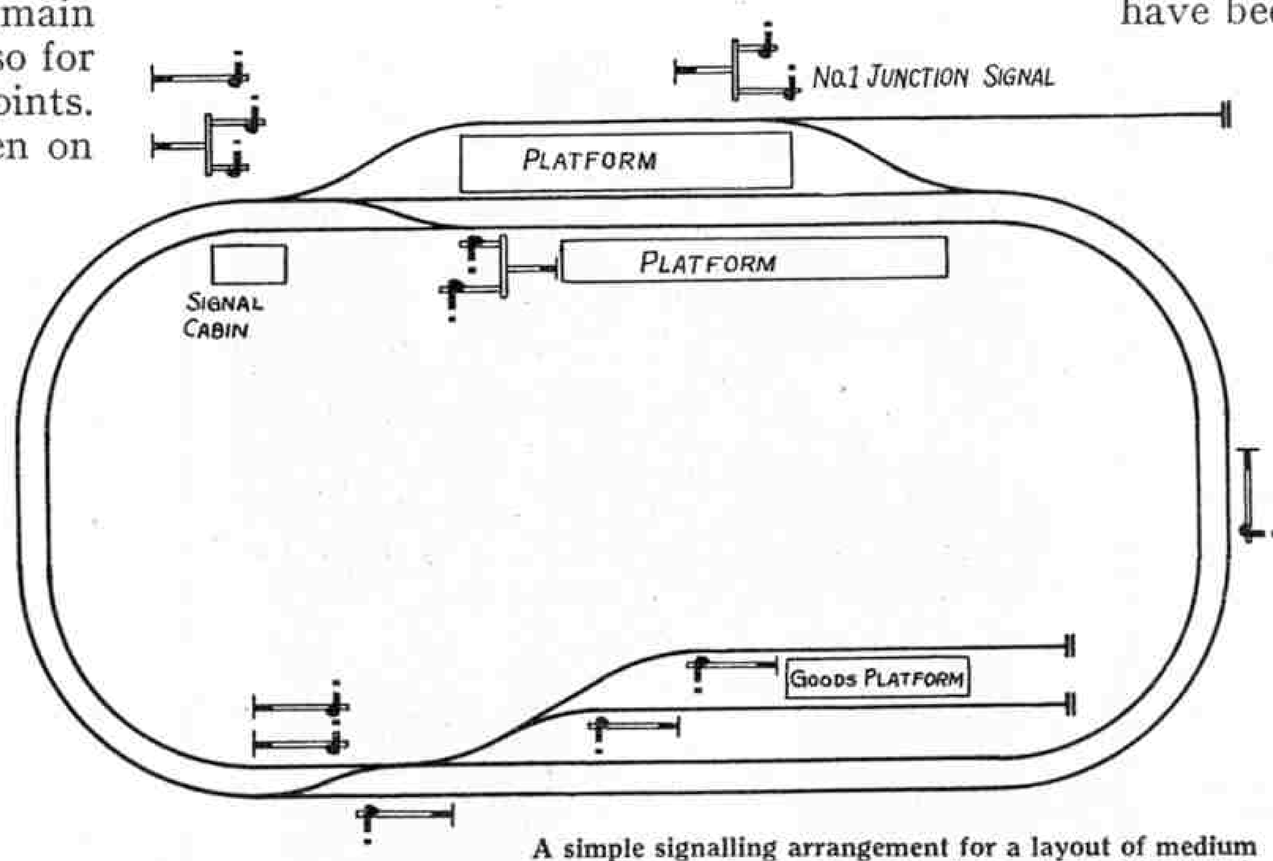
Pioneer (Pietermaritzburg) M.C. — Model-building has been the principal occupation of members, apart from amateur theatricals in aid of Sunday School Christmas funds, to which a small donation was made by the club. Club roll: 11. *Secretary:* A. H. Alley, 461, Burgers Street, Pietermaritzburg.

Signalling a Hornby Layout

Correct Railway Working in Miniature

ONE of the most fascinating tasks a miniature railway owner can have is that of providing proper signals for his layout. The presence of these adds wonderfully to the appearance of a miniature railway, and they are of course absolutely essential if operations are to be carried on in a workmanlike manner. There is no difficulty in doing all that is necessary, for the Hornby system includes a range of signals sufficient to meet practically all requirements. It comprises ordinary "home" and "distant" Signals, "home" and "distant" Junction Signals, Double Arm Signals and Signal Gantries. Each of these has its special uses.

The Junction Signals are primarily intended for governing junctions where there is a branch line to the right or to the left of the main line. They can be used also for controlling Crossover Points. An example of this is seen on the layout illustrated on this page, where there is a Junction Signal on the left of the lower platform in the station. The arm on the taller post controls the main line, while the signal on the shorter post refers to the crossover line. When the latter is in the "all clear" position, a train leaving the platform can travel on to the adjacent track by means of the facing Crossover Points.



A simple signalling arrangement for a layout of medium size. Essential signals only have been illustrated.

In some instances the Hornby No. 2 Junction Signal is not suitable for a particular section of layout, because the taller post is on the left, and the main line its semaphore is intended to control is on the right. This difficulty can be overcome by using the No. 1 Junction Signal, which has interchangeable posts. Another possible solution is to use two separate Signals. On some layouts a divergence from the main line can be governed by two "home" Signals placed side by side, as illustrated at the entrance to the goods yard on the accompanying illustration. This arrangement is often used in actual practice, and looks very realistic on a model railway.

There are some track arrangements for which a single Hornby Signal is not suitable, and a combination of existing Signals must be used. This can usually be done correctly. For instance, three Signals are necessary at the entrance to the station near the Signal Cabin on the accompanying plan. The main line passing through the station requires a Signal to permit a train to approach the main line platform; the loop line to the left of the platform also needs a Signal; and one is necessary for controlling the passage of trains over the Crossover on to the opposite main line. It will be seen that in this instance an ordinary "home" Signal is used to control the loop line. A Junction Signal is placed alongside, each of its two arms fulfilling its usual task, the taller one being associated with the main line and the smaller with the Crossover.

On many layouts it is impossible to control all the movements of trains by means of Signals, and a working arrangement between the signalman and engine driver is then necessary. For instance, the driver of a train leaving the goods yard on the accompanying plan understands that if the "home" Signal for his track is in the "all clear" position, he is permitted to leave the yard and proceed via the Crossover on to the correct track.

Other interesting examples of the use of signals are shown on the layout illustrated. "Distant" Signals have been purposely omitted from this in order to avoid complications, but if the layout is large enough they should certainly be included, for they add realism to the operations carried out. All Hornby "home" Signals have a "distant" counterpart, with the exception of the Double Arm type, which have both "home" and "distant" semaphores on them.

The Gantry Signal is an effective accessory that gives distinction to any track on which it can properly be used. It has four signal posts, two applying in one direction and two in the other, and can be obtained in either "home" or "distant" types. The taller posts are in the centre, and the shorter ones are on the outsides. The Gantry Signal can be used for several useful purposes, including the control of four-track main lines with the fast lines in the centre. It can be employed also for governing ordinary "up" and "down" double track, with lines from which divergences are made, in each case to the left of the main line. The arms on the shorter posts on the outside of the gantry then control entry to the branch lines.

All the Hornby Signals previously mentioned in this article, except the No. 1 Junction type, can be obtained fitted for electric lighting. These signals are fitted with spectacles of correct colour, and they look very realistic indeed, especially when night operations are being carried out. The Hornby Signals fitted for electric lighting can be illuminated from the $3\frac{1}{2}$-volt circuit of a T6A or T20A Transformer, or from suitable flashlamp batteries if a clockwork layout is being operated.

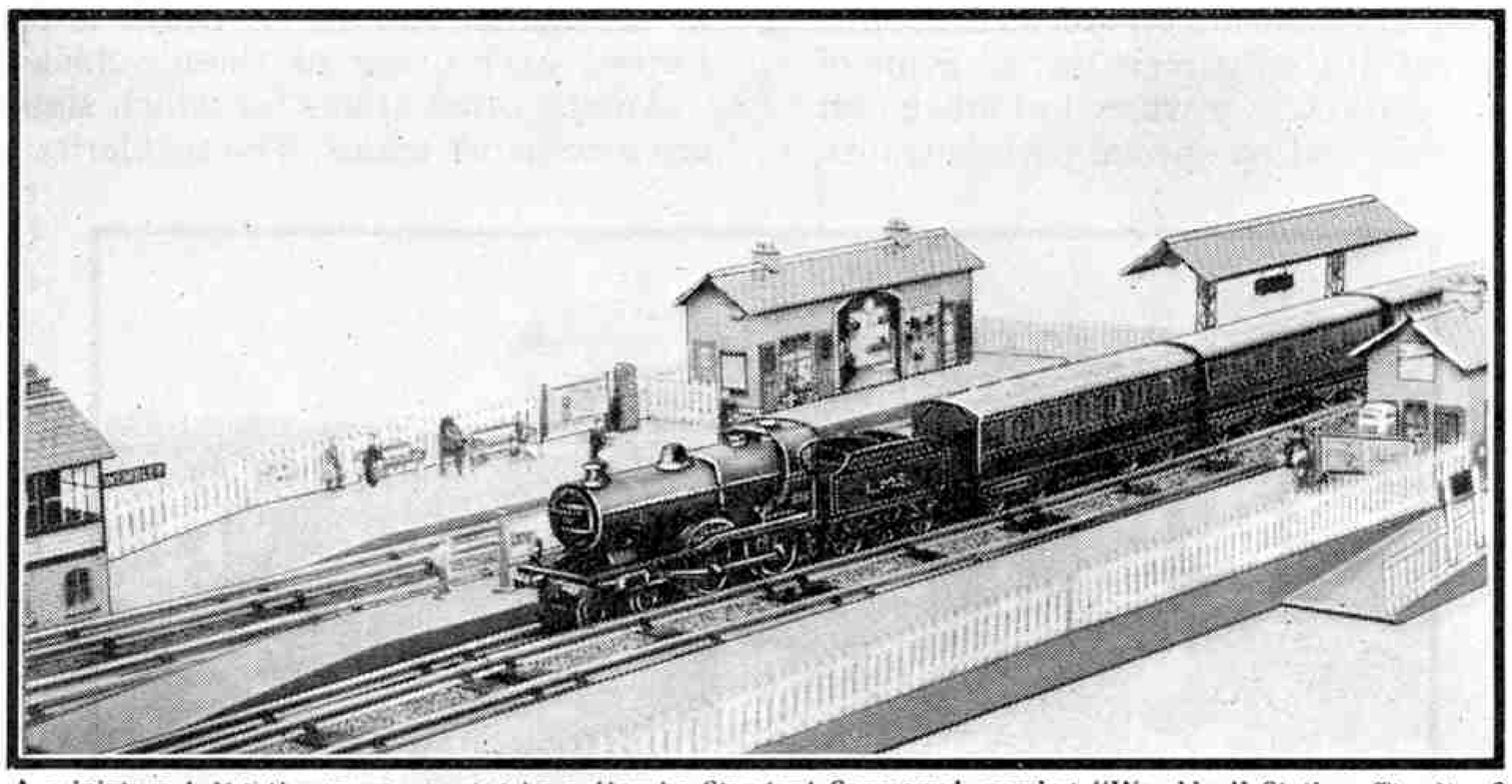
In addition to the larger Hornby Signals there are the simpler and smaller M type Signals. These are attractively finished, and model railway enthusiasts can make good use of them for shunting purposes in goods yards.

Stations on Hornby Railways

By "Tommy Dodd"

A MINIATURE railway layout must include at least one station to be really alive, and if this is provided with miniature passengers and railway workers, together with suitable accessories, it adds wonderfully to the attractions of a Hornby layout.

There is no lack of figures for miniature railways, for many Dinky Toys are suitable for use on the lineside or in stations, and illustrations that have appeared in the Hornby Railway Company pages of the "*M.M.*" show how effective these are. The need for stations also is met by the range of structures of this kind in the Hornby Series. These include the two stations in the M Station Set, which are ideal for the small layouts on which M Trains are run, and the larger No. 1 and No. 2 Stations, realistically designed and reproducing a wealth of detail, are available for the owners of more ambitious layouts. In addition there are Island Platforms, Passenger Platforms and a host of accessories, while goods stations can be represented by the No. 1 and No. 2 Goods Platforms.



A miniature L.M.S.R. express, hauled by a Hornby Standard Compound, passing "Wembley" Station. The No. 2 Stations and the Island Platform included in the layout of the station, have been extended by means of Passenger Platforms, and a Signal Cabin is placed in a good position.

The No. 1 and No. 2 Stations generally are similar in design, the differences between them being that the No. 2 Station has a ramp at each end, with paled fencing, and its station buildings are provided with chimneys, while these features are not included in the No. 1 Station. The buildings of both are attractive, showing details of dining rooms, waiting rooms and other station features, and the booking hall is impressive, with a typical railway clock over the entrance. A particularly realistic bookstall is shown. This provides excellent opportunities for giving "life" to the station scene by placing Dinky Toy "Business Men" and other passengers in front of it, as if buying newspapers or magazines to read in the train.

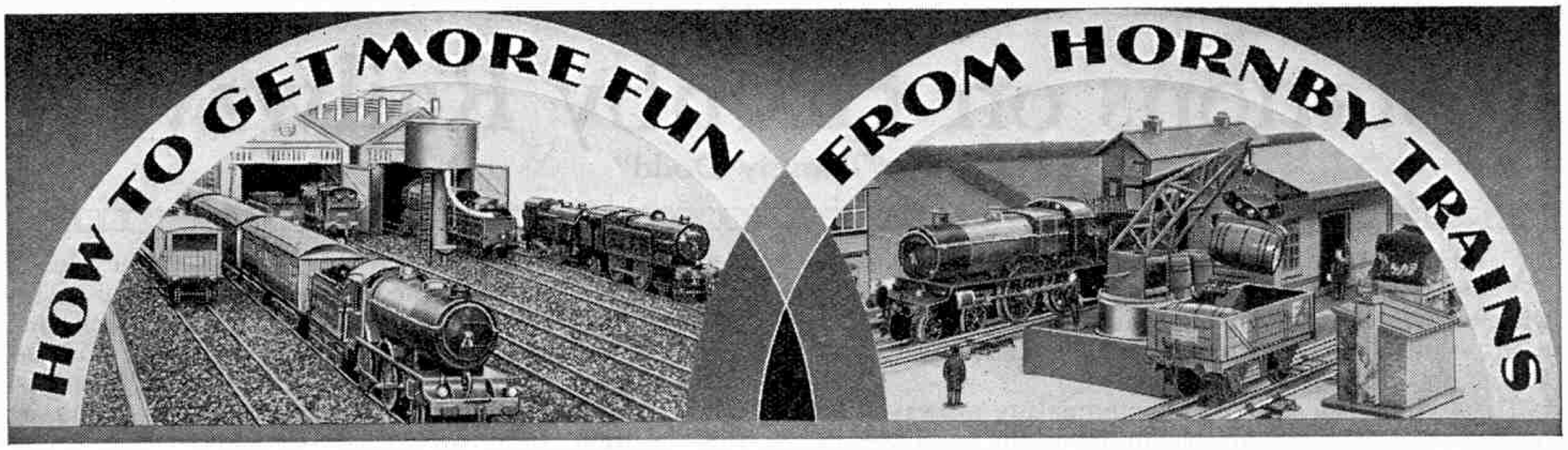
Where possible the No. 2 Station should be included in a layout, for its ramps and the paled fencing at the back give it an imposing and railway-like appearance. Station Name Boards are fitted on the fencing, and the Hornby Railway owner can give his station a name to suit his line, whatever railway it represents, as he has the choice of Wembley (L.M.S.R.), Reading (G.W.R. and S.R.), Ripon (L.N.E.R.) and Margate (S.R.).

The Hornby Stations have the advantage that they can be used to make a terminal station in a very simple manner. Many miniature railway enthusiasts favour a non-continuous layout, with a large terminus, and a structure of this kind can be built from the No. 2 Railway Station and the Passenger Platforms. The latter are plain lengths of platform fitted at each end with locking studs by means of which they can be fixed in front of the main station and at right angles to the range of buildings. Two Passenger Platforms in this position form an attractive bay, which looks particularly well when the track in it ends realistically with No. 2 Buffer Stops, which are of the hydraulic type.

The Passenger Platforms also can be used for extending the No. 2 Station, so that a platform long enough to accommodate the longest train can be built up. Each Passenger Platform is supplied with a length of white paled fencing that gives it the right appearance when it is made part of a lengthened station, and nuts and bolts for securing it in position also are included.

Another interesting item in the Hornby Series is the Island Platform, which is fitted with a roof supported by lattice posts. These Island Platforms also have special locking studs, so that two of them can be joined end to end if necessary, and Passenger Platforms also can be added to them in order to give a station of greater length. The ramps of the Island Platform are removable, so that extensions of this kind can readily be made. These ramps, which are not fitted with Paled Fencing and Station name boards at the back, as in the case of those supplied with the No. 2 Railway Station, can be obtained separately. They can be used for many useful purposes, including the making of a suitable road approach to the rear of the Station, as illustrated on page 178 of this issue. When this plan is followed, Dinky Toy Motor Cars and Lorries also can be used in an effective manner. In addition to the Road Vehicles that are available, there is a selection of other Dinky Toys that can be used to add realism to a station. These include the Telephone Call Box and Pillar Boxes in addition to the various Passengers and Staff.

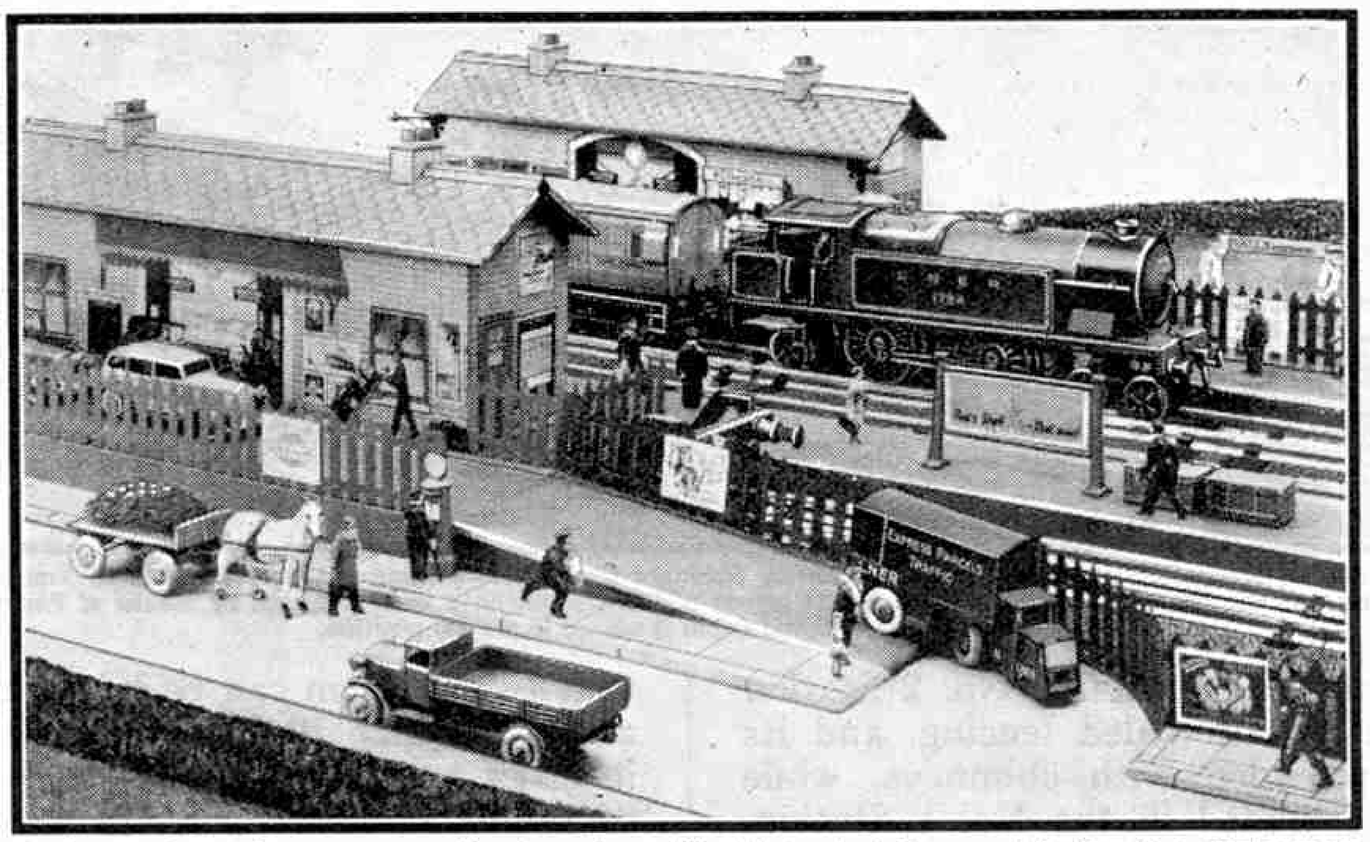
The Hornby No. 2 Stations, Island Platforms and No. 2 Goods Platforms are obtainable wired for electric lighting. When the model railway is being operated at night, as is often the case, these accessories look very realistic indeed if they are lit up, either from flashlamp batteries or from a Meccano Transformer, with a lighting circuit. An illustration of a night scene including the No. 2 Station and other Hornby Accessories fitted for electric lighting appeared on page 51 of the January issue of the "*M.M.*"



MISCELLANEOUS TRAFFIC ON HORNBY RAILWAYS

IN recent issues we have dealt with the running of freight trains and of passenger services on Hornby railways. There are many trains in actual practice that cannot be classified as either purely freight or passenger however. In their make-up and operation these trains belong to both classes, and in this article it is proposed to deal with various schemes for their working in miniature on Hornby layouts.

Railways convey a great deal of parcels traffic. Some of this is dealt with by fast goods train services, but much of it is carried by passenger train and by special parcels trains. It is easy to include in the composition of a miniature "fitted freight" or passenger train a wagon or van for the conveyance of parcels traffic. A Hornby No. O or No. 1 Wagon can be used, but the contents of course must be covered over with Hornby Wagon Tarpaulins to protect them from the weather! The Open Wagon "B" also is particularly useful for such work, for it has a raised rail running the length of the wagon body specially for supporting a Tarpaulin.



An interesting station scene on a Hornby railway. The Mechanical Horse and Trailer Van (Dinky Toys No. 33R) for parcels traffic are being used as suggested in this article.

Those who prefer to do so can use a No. 1 or No. 2 Luggage Van, the opening doors of which allow miniature parcels to be loaded inside in a realistic manner. These Vans are more suitable for inclusion in the make-up of a passenger train than are those previously mentioned. Parcels frequently are loaded into large hampers or "skips," in order to make easy the handling of large quantities varying in shape and size. To imitate these the miniature Hamper included in Set No. 1 of the Hornby Railway Accessories is particularly suitable. Good use also can be made of the other items contained in this Set, particularly for "Passengers' Luggage in Advance" traffic, so much of which is dealt with at busy periods by special trains.

Hornby Train owners who give special attention to parcels traffic on their layouts can easily make up miniature parcels by folding up small pieces of thin brown paper and tying them up with cotton. A few of these piled on the platform itself, or on one or two porters' trucks, as if awaiting despatch by train, will add a realistic touch to the goods or passenger station.

Special trains run for the conveyance of parcels traffic are often formed of vehicles of different sizes and types. The Hornby four-wheeled No. 1 Luggage Vans can be used with the bogie type No. 2 Luggage Vans, and the train can be completed with one or more passenger Guards' Vans. On layouts where more interest is taken in train operation then in the actual loading of traffic a parcels train could be formed exclusively of these vehicles.

Among other trains for which similar vans can be used are newspaper trains. The regularity of the appearance of the daily newspaper is largely dependent on efficient railway service, and on pages 134 and 135 of this issue "Railway Engineer" gives some details of the energetic running required of the L.N.E.R. 2.32 a.m. from Marylebone to Sheffield. Speed is essential in order that the departure may be made as late as possible, and yet allow arrival at different centres in time for early morning distribution. There is a special appeal about such night fliers as mail and newspaper trains, and their running in miniature will add considerably to the realism of operations. Here again is an opportunity for Hornby railway owners to exercise their ingenuity and patience, in making up little bundles to represent bales of newspapers.

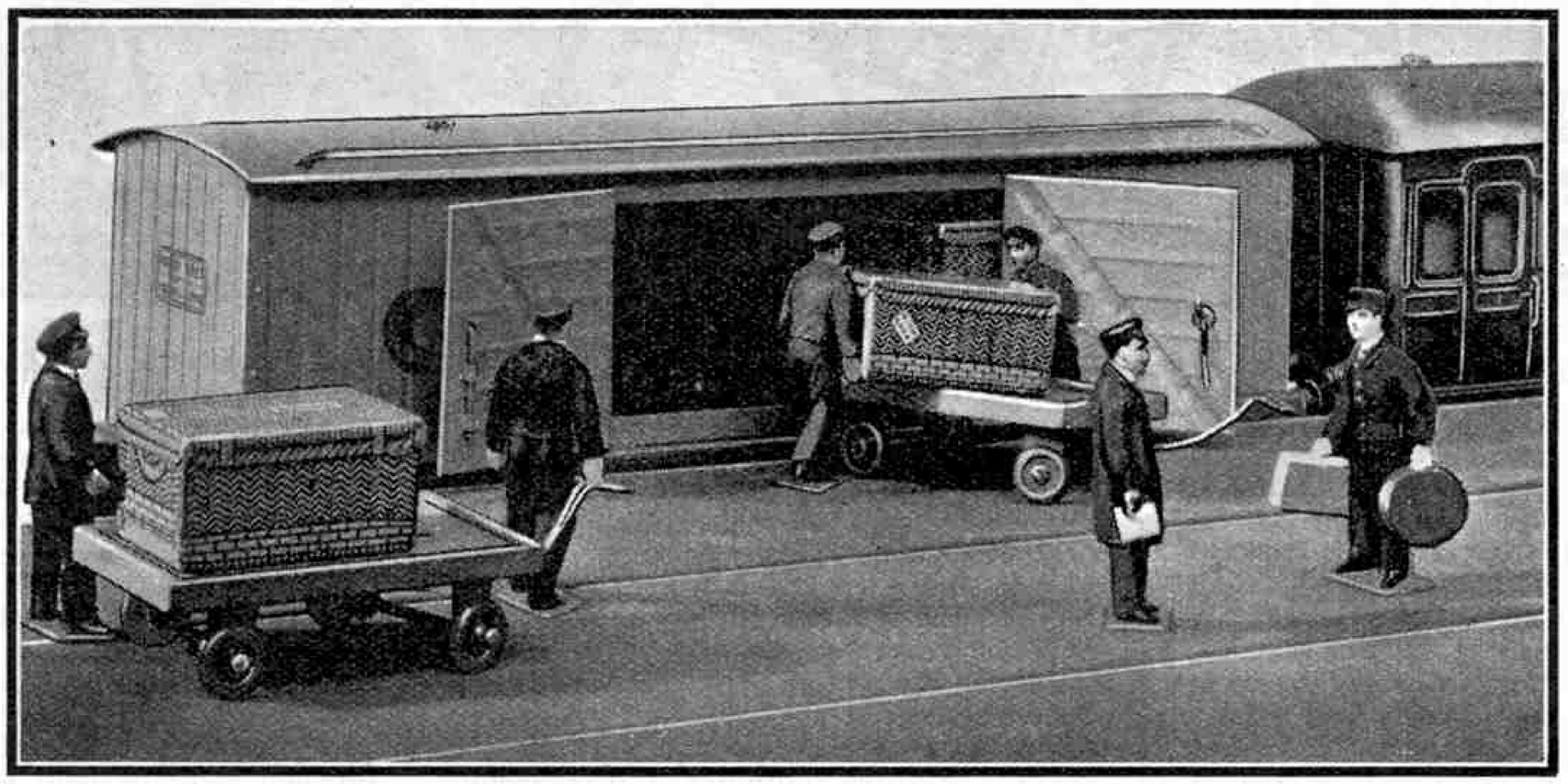
In connection with newspaper trains, the road transport arrangements necessary to bring the loads to the trains and to assist in their distribution on arrival should be represented. Various Meccano Dinky Toy components can be used for this purpose, and a particularly suitable example is Delivery Van No. 28c, which represents a "*Manchester Guardian*" vehicle, and is finished in the characteristic shade of red with gold lettering.

Similarly the road motor services operated by the railway company for the collection and delivery of parcels traffic must not be neglected. For this work the Railway Mechanical Horse and Trailer Van (Dinky Toys No. 33R) is exactly what is required, and represent accurately the units now widely employed for this purpose in actual practice. These handy little vehicles look most realistic when placed in the

neighbourhood of any of the stations on the miniature system. The development of the road motor services of the railway company can be made very interesting. A Garage (Dinky Toys No. 45) will be necessary to accommodate the road motor vehicles, and the Petrol Pumps and other accessories of Dinky Toys No. 49 also can be used in a realistic manner. The younger members of the railway staff will find a great deal of fun from the operation of the various Dinky Toy vehicles.

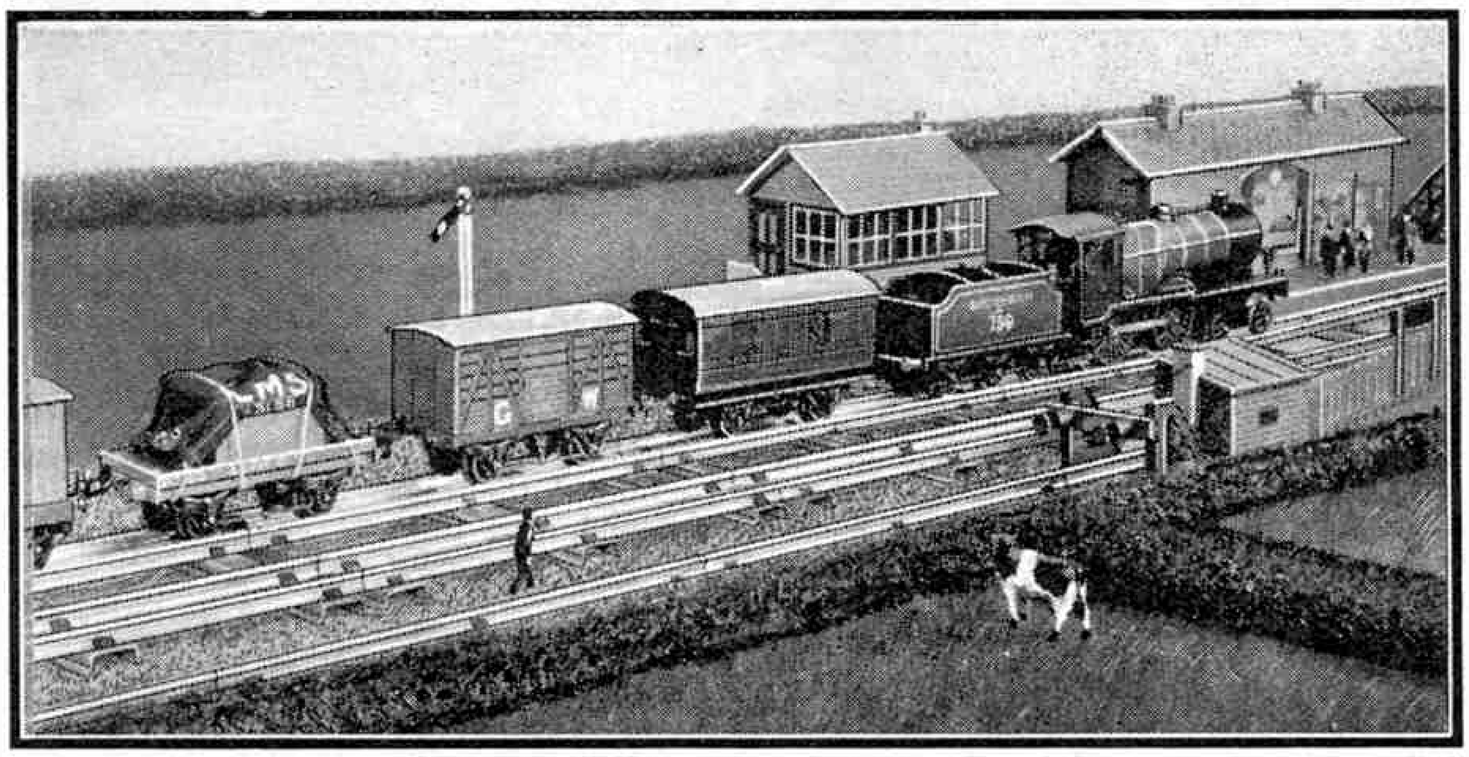
The transport of motor cars by rail may at first seem a curious proceeding, but the need for it may arise in several ways. The despatch of a bulk consignment of cars from a works situated inland to a port for shipment may require the running of a special train of vans suitable for the conveyance of cars; on the other hand, imported cars may require to be sent from a port to a distant centre. Then again when cars are being sent for exhibition at a Motor Show their number may necessitate a "special." On such occasions it is usual to attach to the vans conveying them a special poster drawing attention to the purpose of the train; practices of this kind reproduced in miniature add considerably to the interest of operations, and most Hornby railway owners will not find it difficult to arrange suitable posters to be gummed to the sides of the vehicles forming a "Motor Car Exhibition Special" on their system.

Cars are frequently sent by rail also over long distances, so that their owners may enjoy their use in a district to which they are journeying and yet avoid the necessity of driving them perhaps several hundred miles in order to get there. At holiday times this traffic also may require the running of a special train; and there are always odd cars to be transported from place to place. There is no lack of suitable motor vehicles among the Meccano Dinky Toys, and for their transport the No. 2 Luggage Van is the most satisfactory vehicle in the Hornby Series. It has wide double doors that facilitate the loading and unloading of the vehicles and will accommodate two Dinky Toy motor cars. Alternatively the very useful Flat Truck can be employed; strictly speaking a miniature car travelling on this vehicle should be covered over with a Wagon Tarpaulin, but Hornby Railway owners may prefer to omit this, as a Dinky Toy motor car forms rather a spectacular load.



Loading a No. 2 Luggage Van that is attached to a passenger train. The hampers shown are those contained in Hornby Railway Accessories Sets No. 1, and they can be effectively used for a variety of purposes.

Apart from through trains operated specially for traffic of a particular type, trains of a miscellaneous character are run for roadside work, that is the picking up and setting down of traffic at intermediate stations. The make-up of these varies considerably; milk cans, either full or empty, may form the bulk of their load, so that here again several different types of vehicles can be used. The No. 1 Milk Van with its load of churns is most effective, and there is also the tinprinted No. O Milk Van. These are essential for the transport of "full" churns, as their open-boarded sides afford the necessary ventilation for keeping their freight cool and fresh. For "returned empties," however, No. 1 or No. 2 Luggage Vans can be used if necessary according to the requirements of traffic. A Guard's Van, too, should be included, in order to complete the trains in the appropriate manner, as in the illustration below.



A typical "milk and parcels" train in miniature. This is made up of several different kinds of vehicles, and is being hauled by a Hornby S.R. No. 2 Special Express Locomotive.

The engines used on the trains we have mentioned vary considerably. Even on purely local work it is not unusual to find a large express engine. Possibly it may be filling in its time usefully between two harder turns of duty; or it may be in the "running in" stage after a visit to the shops. On a Hornby system, therefore, there is every excuse for the appearance on such trains of an E320 Locomotive, as representing the biggest express types. For the more important through trains such as special parcels or newspaper trains, the use of an E320 or E220 Special is of course essential. As in actual practice much useful work can be done by locomotives of the "mixed traffic" type, and the most suitable engine of this kind in the Series is the E120 Special. The lighter short-distance turns of duty can be worked satisfactorily by any of the well-known Hornby Tank Locomotives. The particular one chosen will depend on what power is available at the locomotive depot at the time, and the exact nature of the work.

Branch News

SPRING GROVE CENTRAL SCHOOL.—Meetings have been held on Saturday mornings in the School laboratory, where as many as six parallel lines have been laid on the bench tops. Boards carrying single lines are used to connect the benches and so form a continuous layout. A different layout is arranged at each meeting, part of the time being spent in track laying, and the rest in train operations. Secretary: S. Cordrey, 211, Hounslow Road, Hanworth, Middlesex.

ST. ANDREW'S (MONTPELIER) BRISTOL.—Track meetings have been held regularly during the present session, and a programme of railway films has been shown. Lectures on railway topics also have been given. A Branch Library has been formed, and already contains 100 books on subjects of railway interest. Visits have been paid to the G.W.R. Depots at Temple Meads and St. Phillip's Marsh. Secretary: K. Bartlett, 33, Bath Buildings, Montpelier, Bristol, 6.

HORNSEA.—Interesting services have been run on the Branch layout at recent track meetings. The line is laid between "Windsor" and "Dover," and special traffic has given interesting running. At one meeting cattle were conveyed by train to an agricultural show at "Dover," thick fog increasing the difficulties of operations. At another, express milk trains had to be run to cope with the increased trade in milk, and a third was devoted to conveying a large travelling circus to "Dover" for shipment to France. On the third of these occasions a powerful engine had to be used owing to the great weight of the train, and a passenger coach was included to carry the circus company. Interesting test runs have been staged between miniatures of *"The Flying Scotsman"* and *"The Silver Jubilee"* trains. Secretary: P. Richardson, 1, Victoria Gardens, Cliff Road, Hornsea.

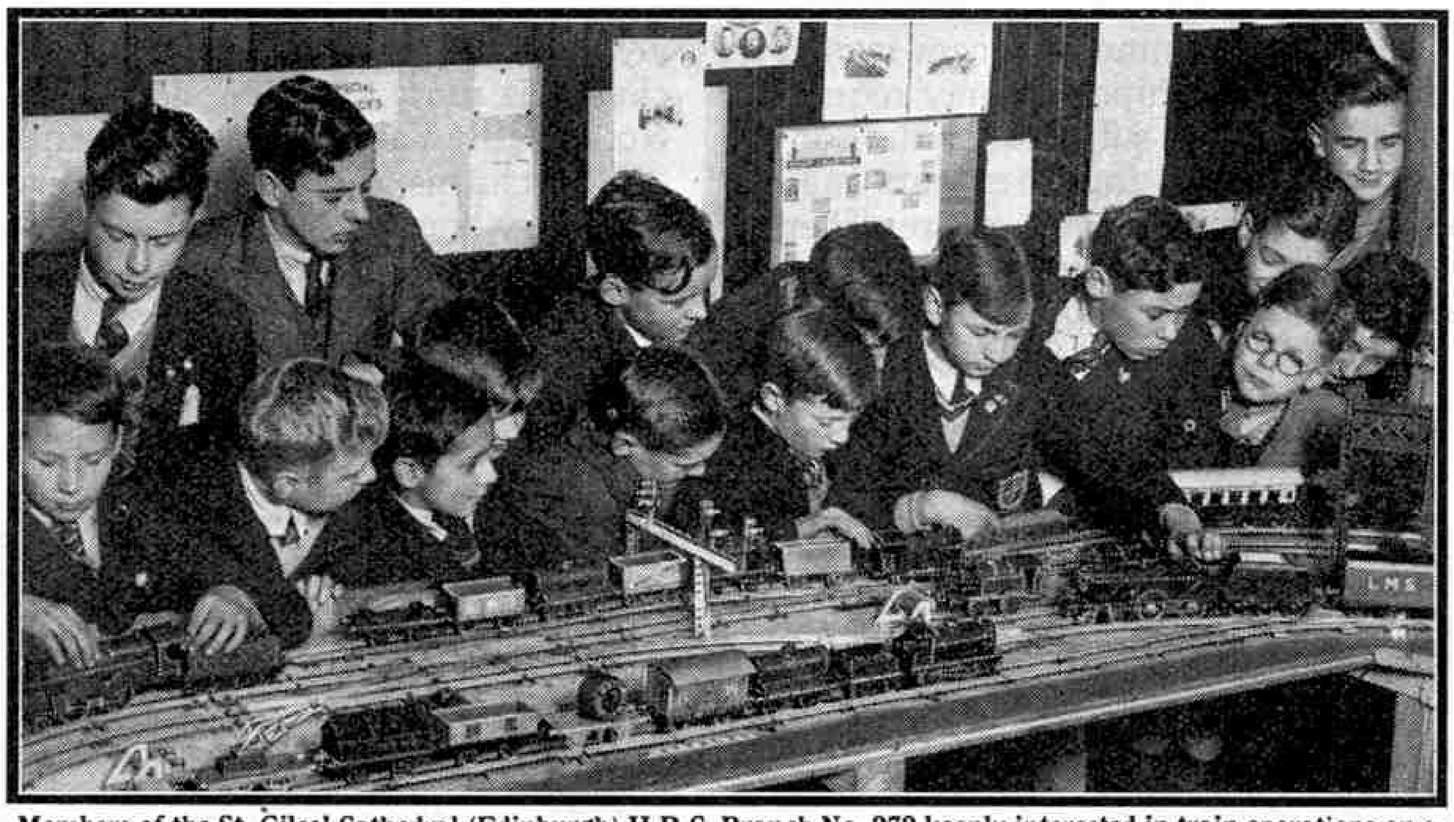
SWAN (KIDDERMINSTER).—A further visit has been paid to Mr. Oakley's extensive scale model railway. His locomotives include several G.W.R. engines of various types, and a Hornby No. 1 Special Tank Locomotive that bears the brunt of the shunting work. Members much appreciated his kindness in allowing them to operate his railway, and also in explaining the working of his L.N.E.R. "Pacific." This locomotive is a large one, and members were promised a trip behind it. The Branch track has been extended, and additions to the layout have included a Hornby No. 2 High Capacity "Coal" Wagon, signals, wagons and a coalowner's hut. Supper is very kindly provided at meetings by the secretary's mother. Secretary: L. A. D. Hamblin, Black Bull Hotel, Swan Street, Kidderminster.

ST. CHRISTOPHER SCHOOL.—Meetings are held on Saturday mornings, and occasionally on Tuesday after school. A successful electric layout has been arranged, the track being screwed on to plywood. The main double track is made in five sections for easy removal and storage. Sidings are laid down at each meeting in accordance with the wishes of members. Working is keenly carried out by members. Secretary: D. G. Jobling, 26, William Way, Letchworth, Herts.

PLYMOUTH.—An Open Evening has been held to celebrate the 10th birthday of the associated Meccano club. Merit Medallions were presented on this evening, and a Meccanograph on loan from Headquarters attracted much interest. A special birthday issue of *"The Gearbox,"* the Branch magazine, was published. An "Adana" Printing Press has been bought out of Branch funds, and is to be used for printing the magazine and other purposes. Mr. Dingle, Leader of the St. Stephen's (Saltash) Branch, recently visited the club rooms and was appreciably surprised at the improvements that have been made during the last year. Track meetings have been held regularly, and several excellent layouts have been worked out. Secretary: R. G. Symons, 47, Lisson Grove, Plymouth.

GREENOCK.—Membership has increased, and attendances at weekly meetings have been excellent. Timetable working has been tried out for the first time, with satisfactory results. Shunting practice has increased the efficiency of members in train operation. A Lantern Show has been given, and a Debate provided an opportunity for keen discussion. An Exhibition is to be held shortly. Secretary: G. Bruce, 8, Margaret Street, Greenock.

BEDFORD SCHOOL.—The monthly subscription for members has been reduced to 6d. A fine of 1d. has been instituted for violations of rules, with a view to reducing the number of accidents. Work on the laying of the Branch track is progressing, and Platform No. 3 at "St. Pancras" is now open to clockwork traffic, though it is not yet available for electric working. The down line has been similarly completed slightly beyond "Kettering." It is hoped that members will be able to pay a visit to the Willesden Motive Power Depot of the L.M.S.R. Secretary: J. E. D. Rothwell, 6. Kimbolton Avenue, Bedford.



Members of the St. Giles' Cathedral (Edinburgh) H.R.C. Branch No. 272 keenly interested in train operations on a section of their extensive model railway. The Branch was incorporated in August 1934, and now has a membership of over 100. Chairman, Mr. R. Croall; Secretary, H. W. Govan. Photograph by courtesy of the Editor of the "Edinburgh Evening News."

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below.

ABBEYFEALE—B. Hynes, Provincial Bank House, Abbeyfeale, Co. Limerick.

BIRKENHEAD—F. Reed, 24, Alton Road, Oxton.

DERBY—C. H. Lochrane, Darley Slade.

KIRKBY-IN-ASHFORD—J. W. Tomlinson, B.Sc., "Fairburn," Lime Tree Avenue.

SWINDON—B. F. Griffin, 88, York Road.

Branch Recently Incorporated

318. UNIVERSITY COLLEGE SCHOOL, LONDON—H. Mayer, 47, Corringham Road, N.W.11.

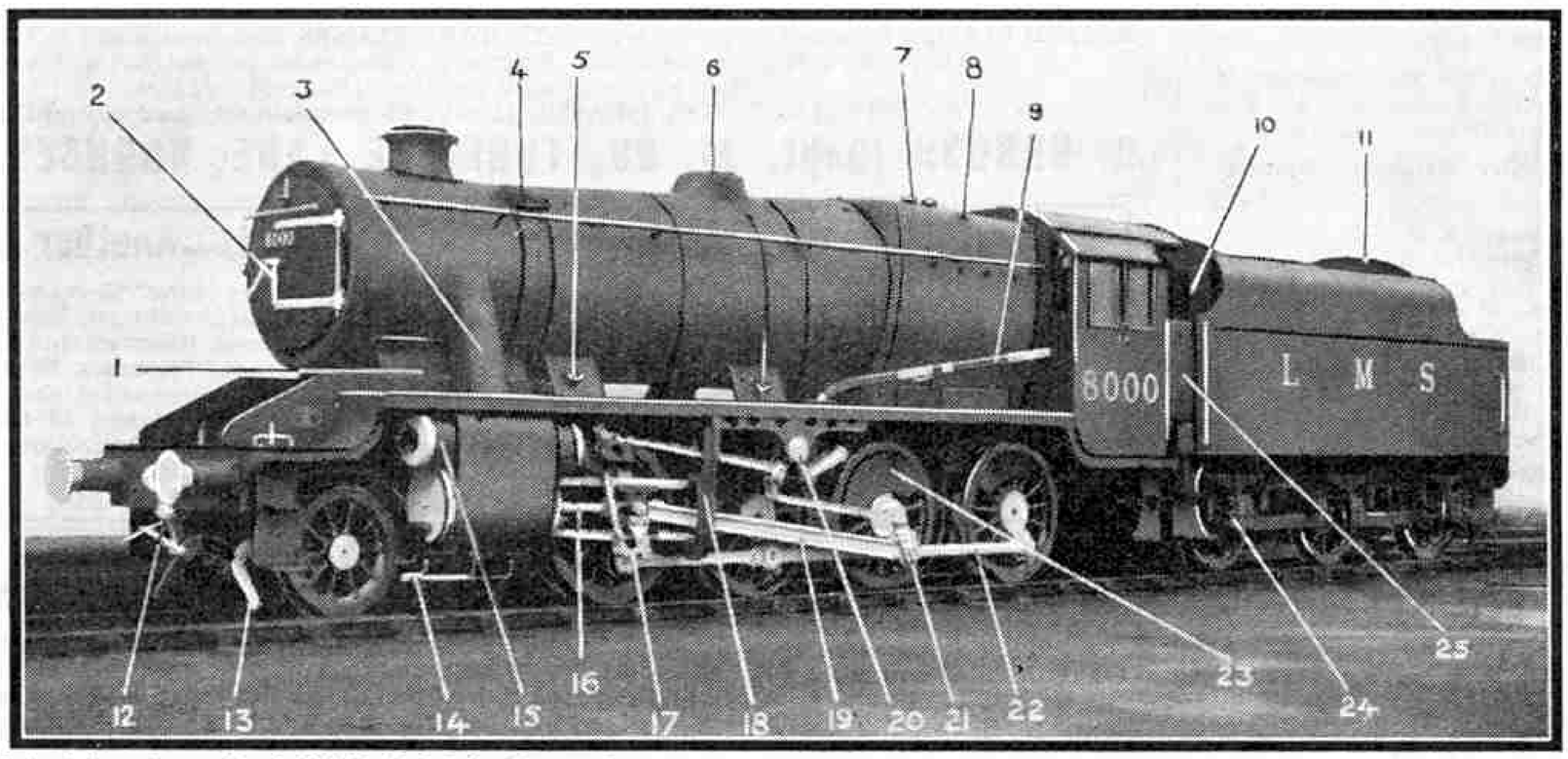
H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

A LOCOMOTIVE PROBLEM

In these days of high speed travel on land, by water and in the air, the steam locomotive still maintains its attraction for every boy and for H.R.C. members in particular, for no other power unit gives such a wonderful impression of tremendous forces under perfect control. The general principles on which the engine works have remained unaltered since Stephenson's day, but the locomotive has grown and has been developed to a wonderful extent. To-day it includes many devices that add to its power or speed, or make it easier to run and control, and this month we announce a competition that will test in a direct and novel manner the knowledge possessed by H.R.C. members of the parts of a modern locomotive and their purpose.



Selected parts on the L.M.S.R. 2-8-0 freight engine shown above have been numbered, and entrants in this interesting competition, open to all members of the H.R.C., are asked to name the parts and explain their purpose.

The illustration on this page shows an L.M.S.R. 2–8–0 freight engine, and on it certain carefully selected parts have been distinguished by numbers. The parts so marked are essential for efficient working, and competitors are required to name them and explain what they do. In the solution the number and name of each part should be given, and this should be followed by an account of its purpose that should be brief, but should make clear its share in the work of the engine. Entries must be written on one side of the paper only, and each should have on the back the name, H.R.C. membership number and full address of the competitor.

The contest will be divided as usual into two sections, Home and Overseas. Prizes consisting of any products manufactured by Meccano Ltd., to the respective values of 21/–, 15/– and 10/6, will be awarded to the three competitors in each section who submit the most correct solutions. In the case of a tie for any prize, the prize money will be equally divided. Several consolation prizes also will be awarded in each section in addition to the three main prizes.

Envelopes containing entries must be marked "*H.R.C. March Problem*" in the top left-hand corner, and must be posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st March. The Overseas closing date is 30th June.

Articles Suggestions Contest

Model railway enthusiasts are always seeking to improve their layouts or planning schemes for more interesting working. We wish we could be at hand to give every H.R.C. member personal advice and assistance in his efforts to get more real fun from his hobby. Unfortunately this is impossible, but we can help enthusiasts by special articles in the "*M.M.*" if we know what their problems are. We therefore ask readers to submit six suggestions for articles dealing with points of miniature railway working on which they themselves would like further information. In most cases it will be sufficient to suggest titles for the articles, but a few words of explanation may be added if this is thought desirable.

The competition will be divided into the usual two sections, Home and Overseas, and prizes consisting of any products manufactured by Meccano Ltd., to the respective values of 21/–, 15/– and 10/6 will be awarded in each section to the three competitors whose suggestions are considered best by the judges. A number of consolation prizes also will be awarded.

Competitors must write their names, H.R.C. membership numbers, and full addresses on the backs of their entries, and the envelopes containing these should be marked "*H.R.C. March Articles Contest,*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st March. The closing date for competitors in the Overseas Section is 30th June.

COMPETITION RESULTS

HOME

"NOVEMBER LAYOUT PLANNING CONTEST"

Owing to reasons of space it is not possible to publish the layout plan that was awarded the First Prize in this Contest. The winner, C. E. Wrayford (6039), of Moretonhampstead, Devon, made excellent use of Hornby Track and Accessories and all sections of his layout plan were designed with some definite object in view. His entry consisted of a single track main line throughout, and excellent arrangements were made for goods yards and passenger stations.

The Second Prize in this Contest was awarded to J. E. Murrell (45368), London, S.E.24, whose plan consisted of a double track main line. The arrangements made for stations were quite good, but the entry was unfortunately spoilt by the design of the carriage sidings and marshalling yard, which were too short to be of any use. If these had been longer in order to accommodate trains of reasonable length, the entry would have been even more meritorious.

"January Mixed Names Contest."—First: J. C. Button (10335), Crewe, Ches. Second and Third Tie: J. L. Stevenson (22346), Edinburgh, 11 and C. W. Lex (14033), Kingston-on-Thames, Surrey. Consolation Prizes: G. Johnston (38784), Southall, Middx.; C. E. Wrayford (6039), Moretonhampstead, Devon; R. L. Cheesman (48420), Grove Park, London, S.E.12; D. Earle (41617), Wembley Park, Middx.

"January Voting Contest."—First, Second and Third Tie: J. B. Marriage (46757), Westcliff, Essex, J. C. Button (10335), Crewe, Ches. and K. J. Sturt (50732), Bungay, Suffolk. Consolation Prizes: M. Hoskins (16653), Exeter, Devon; J. Gale (19235), Lyndhurst, Hampshire; R. A. Schofield (49049), West Jesmond, Newcastle-on-Tyne; R. Unitt (4044), Stratford-on-Avon; D. V. C. Bentley (24591), Loughborough, Leics.

OVERSEAS

"October Sharp Eyes Contest."—First: I. Brough (9112), Preston, N.18, Victoria, Australia. Second: D. Murison (37642), Buenos Aires, South America. Third: A. A. Tibbitts (24271), Salisbury, Southern Rhodesia, Africa. Consolation Prizes: A. McIntyre (30925), Winnipeg, Man., Canada; J. C. Carter (46374), Capetown, South Africa.

"October Questions Contest No. 8."—First: R. Pearson (29199), Richmond, E.1, Victoria, Australia. Second: A. G. Fellows (29952), Northcote, Auckland, N.4, New Zealand. Third: D. Murison (37642), Buenos Aires, South America.

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½ lb. (abt. 2,000 stamps) ... **2/9** Post Free
1 lb. (,, 4,000 ,,) ... **5/–** ,, ,,
2 lb. (,, 8,000 ,,) ... **8/6** ,, ,,
Abroad—add 6d. per ½ lb. Extra for postage

SAMPLE ¼ lb.—**1/6** Post Free. (*Abroad 1/10*)

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This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/– each or more. (I do not sell less than 100.)

H. HARDY, "Hoyland," Potter Heigham, Norfolk.

K. E. VIII & VIMY

Collections of K.E. VIII issues are hardly complete without a souvenir of the only Official Public Ceremony at which he officiated abroad as King of England. We offer 2 Official View Cards, showing all 4 stamps complete (2 Impressed and 2 Adhesives) with special VIMY RIDGE P.O. cancellation, dated UNVEILING DAY at **5/-**. These are REALLY RARE!

Fuller details and price lists FREE.

NORRIS & CO. (Dept. M.). NORWOOD, LONDON, S.E.19.

THE DUKE OF WINDSOR STAMP PACKET FREE!

Except the British stamps, only 11 different Colonial King Edward VIII Stamps were issued, and there is one of them in this wonderful packet of 32 varieties, and it is undoubtedly a rarity of the future. Amongst other fine stamps, there are emissions from Philippine Islands, Charkari State, Sets of Japan, Canada, Australia, and Spain, Hyderabad, Iran (Lion), Czecho-Slovakia and Morocco Agencies. Finally we are including a beautiful Vatican City stamp, a fine Jubilee stamp depicting Queen Mary, and lastly a fine portrait issue of the present Pope. All ABSOLUTELY FREE. Just send 2d. postage, requesting approvals and new free 1937 Catalogue. Send immediately.

LISBURN & TOWNSEND (Dept. M.M.), LIVERPOOL 3

FREE Wonderful 1937 offer 20 New Issues and Novelties

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G. P. KEEF, Willingdon, Eastbourne, England.

THE "DIAMOND" PACKET IS THE ONLY PACKET

OF UNSORTED STAMPS ON THE MARKET with 15 years' reputation behind it. It contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **MANY RARE STAMPS** have been found in it. 1 pkt., **1/6**; 3 pkts., **3/9**; 5 pkts., **6/–**. All post free inland. Postage to Colonies 3d. per pkt. extra. Foreign, 6d. extra.

Ask your stationer for the "Diamond" packet.

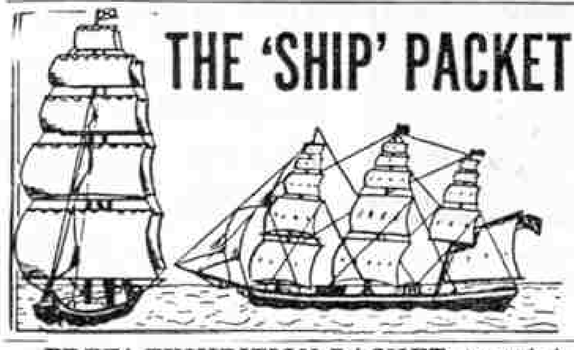
SPECIAL TURKS ISLANDS JUBILEES complete set, used or unused, 5/6.

O. NERUSH (Dept. A), 68, TURNPIKE LANE, HORNSEY, LONDON, N.8.

Air Mail • King Edward VIII • Pictorials—Another BUMPER Gift

For every stamp collecting reader of the "MeccanoMagazine"—a luxurious feast of stamps—**FREE.** Beautiful mint 1d. **New Zealand Airmail, King Edward VIII** Colonial, just issued, **Roumanian** Airmail, and, **in addition,** a surprise selection of magnificent **Pictorials, Novelties and Commemoratives.** A free packet sparkling with interest for your collection. **ACT NOW**—send 2d. postage and ask for a selection of **Globe-Trotter** approvals, famous for sensational value. Ask for particulars of **FREE** stamps every 14 days!!!

GLOBE-TROTTER, 17, WINCHESTER RD., BIRCHFIELD, B'HAM.



THE 'SHIP' PACKET

This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on 't.** A regular armada. **GABOON,** New Issue **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO-CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS.** etc. Price **4½d.**, postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA, 100 BRITISH COLONIALS 1/–, 20 AIRPOST 6d., 6 TRIANGULARS 6d., 50 PERSIA 4/–, 2 ASTRID** (mourning stamps) **2½d., VOLUMES OF B.O.P. CHEAP.**

H. C. WATKINS (M. Dept.), Granville Road, BARNET

FREE! EXHIBITION PACKET containing 50 different stamps including **Antwerp 1894** and **Brussels 1896 Exhibitions, Plebiscit,** set of **Austria** (all mint), Canada, etc., 250 mounts, duplicate book, and perforation gauge. Request approvals. Enclose 2d. postage. Special Bargains for Beginners—Stanley Gibbons Album, holds 3,000 stamps. Illustrated 7½d. 100 different stamps 5½d.
A. R. Dickie (Dept. M), 23, Winscombe Cres., Ealing, W.5

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Senior Packet of 28 different **Mint Stamps** from British Pacific Islands of Aitutaki, Cook, Fiji, Gilbert & Ellice, Nauru, Niue, New Hebrides, New Guinea, Papua, Rarotonga, Tonga, Samoa, Western Samoa, at **Bargain Price** of **2/6.**

Junior Packet of 16 different **Mint Stamps** from the above countries, **1/2.**

Senior Packet of **40 Different Mint Stamps** from **British Atlantic Islands** of Antigua, Ascension, Bahamas, Cayman, Dominica, Falklands, Grenada, Leeward, Montserrat, St. Helena, St. Lucia, St. Vincent, Turks & Caicos Is. At **Bargain Price of 3/3.**

Junior Packet **22 Different Mint Stamps** from the above Colonies. Price **1/6.**

Senior Packet of **33 Different Mint Stamps** from **British African Countries** of Basutoland, Bechuanaland, B.E.A., Somaliland, Gambia, Morocco, Tangier, Seychelles, S. Leone, S. W. Africa, Soudan, Swaziland, Kenya-T-U., Zanzibar, Mauritius. **Bargain Price** of **2/3.**

Junior Packet of **12 Diff. Mint Br. African Stamps.** Price **7d.**

Senior Packet **40 Different Mint Stamps** from the British Asiatic Countries of Bahrain, Borneo, Brunei, China on H.K., Cyprus, Johor, Kedah, Kelantan, Kuwait, Negri-Sembilan, Pahang, Palestine, Perak, Sarawak, Selangor, Trans-Jordan and Trengganu, at **Bargain Price** of **2/6.**

Junior Packet of **17 Different Mint British Asiatic Stamps.** Price only **9d.**

Four Senior Packets, 141 Different Mint British Colonial Stamps, from the countries named. Price only **11/-.**

Four Junior Packets, 67 Different Mint, British Colonial Stamps, from countries named. Price only **3/6.**

All Postage Extra. Cash with Order. Subject Unsold.
EDWARD SANDELL, 10, Evelyn Grove, Southall, Mddx.

FREE

TRIANGULARS • JUBILEES • AIR MAILS

FREE

We consider this to be the **finest Free Offer** we have yet made, as this unique collection includes: Switzerland (Dove of peace), beautiful Mozambique **Triangular (Air Mail),** Canada Jubilee (King George and Queen Mary in State Robes), 2 fine **Mint Air Mails** and a fine collection of **25** different superb British Colonials), all of which will soon be obsolete. This wonderful packet will be given **FREE** to all who send 2d. postage and request approvals. No approvals sent abroad. Price of packet alone **9d.**

MICHAEL HERBERT (M.M.), 8, Woodstock Rd., Walthamstow, London

CAYMAN ISLANDS PACKET

This splendid packet contains modern issues, mint and used, including **Mint Cayman Islands** (illustrated), Australia (telephone cable), **Belgium (Prince Baudouin,** mint), Ceylon, Nigeria and South West Africa **(all new pictorials),** Set of 2 German Commems., Set of 5 Italy (Foundation of Rome) and a **splendid lot of 10 different Canada, including the scarce 20 cent 1935 shewing Niagara Falls.**

All these good stamps for 6d. only, to genuine applicants for our approval sheets. (Without approvals 1/-.)

SHIRLEY STAMP CO., 19, SANDRINGHAM AVENUE, LONDON, S.W.20.

The NEW "TRANSPORT" Packet

Contains a wonderful assortment of 44 foreign and colonial stamps including the following, which depict various means of transportation, **Tunis** (water carrier), **Senegal** (bridge and boats), **Mauritania** (crossing desert), **Mid. Congo** (train and bridge), **Sth. Africa** (ship), **Germany** (aeroplane), **Austria** (horseman), **Indo China** (boat), **Mozambique** (aeroplane), **Gaboon** (raft), **Greece** (bridge and liner), **St. Pierre and M.** (trawler), **Fr. Guinea** (native carriers), **Dutch Indies** (Steamboat), **Madagascar** (native transport), **Brazil** (aeroplane), **Belgium** (train), **Roumania** (aeroplane), **Newfoundland** (steamship), **Fr. Morocco** (camels). **Price 6d.** Purchasers asking for approvals will receive **Ceylon** Silver Jubilee and Pictorials free.

BURDOCK & FLURY,
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NO?

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"Worth While" Sheets for Stamps Worth While.

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IN STOCK AGAIN. POSTAGE 1½d. EXTRA.

11 Morocco King Edward VIII ... ... mint **1/-**
1 Australia Hermes, 1/6 ... ... used **4d.**
3 Germany, Winter Olympic ... ... ,, **1/-**
1 ,, ,, Lufthansa Air Pictorial ... ,, **3d.**

J. R. MORRIS, 9, Audley Road, Folkestone, Kent.

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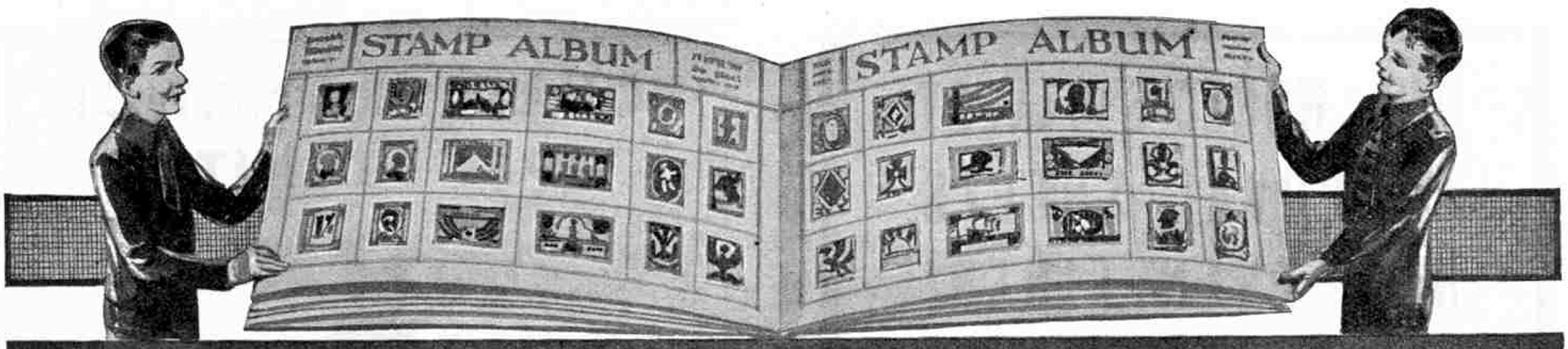
Fine BRITISH COLONIAL sets of **DOMINICA** and **TURKS & CAICOS ISLANDS FREE** to all Collectors sending 2d. stamp and requesting a selection of **BRITISH COLONIAL STAMPS** on approval. **ALL BRITISH COLONIAL APPROVALS** contain new and recent issues of Kings' Heads and Pictorials, Jubilees.

C. H. SHAW (Dept. M.3), 95, CHRISTCHURCH AVENUE, KENTON, HARROW.

See also other stamp advertisements on pages 184, xix and xx



STAMP COLLECTING

MAORI ART ON STAMPS

THE Maori designs to be found on the stamps of New Zealand are of outstanding interest, for they picture typical members of Maori tribes, their homes, and their arts and crafts. The great skill in decorative carving is the outstanding feature of Maori art, and almost every New Zealand stamp issued in recent years has been graced by a border depicting Maori carving.

This carving takes a traditional form, based upon certain standard symbols that have sacred meanings to the Maoris. The design of the carving is varied and disguised by reversing, inverting, halving or multiplying the symbols, and by the use of fish and animal outlines. The origin and meaning of the symbols was known only to a few Maori chiefs, to whom the knowledge was handed down through the sacred legends, and the great majority of the old native artists knew little or nothing of the significance of the symbols. Thus it comes about that work performed to-day differs from that of very early times only in the arrangement of the design.

Careful comparison of an ancient and a modern piece will reveal that the symbols and devices composing the design are identical. It is not easy to demonstrate this point conclusively with stamps. The same symbols are used in tattooing, however, and examination of the tattoo marks on the face of the Maori chief depicted on the 1½d. value of the N.Z. victory issue of 1920, reproduced here, with those on the face of the veteran chief pictured on the front cover of the October, 1936, "*M.M.*," shows a close similarity of pattern.

Another interesting illustration of this point can be found in a comparison of the small symbols in the inner corners of the design of the current 3d. stamp, with the general pattern of the carved panel shown on the 9d. value from the same series. Both stamps are illustrated on this page. The monochrome rendering here of the 9d. stamp is a very dull reproduction of the beauty of the original, which is richly coloured in black and blood-red, the latter colour being in fact the Maori sacred colour.

Native carvers at work in their village are shown in the design of the 1d. value of the 1906 commemorative issue, illustrated here. There is an interesting feature in this design. According to native belief it was unlucky, particularly in carving the prow of a war canoe, for a woman to be present at any stage of the proceedings. In the stamp design, a Maori woman is actually seated alongside the log that is being carved!

Those of our readers who have read the articles dealing with Maori carving in the August and October 1936 issues of the "*M.M.*" will remember that we related there the reverence and awe in which trees and carvings were held by the natives. In the felling of the trees and in the carving certain rites must be performed. The chips of wood cut in the felling of trees were sacred and must be burned upon sacred fires. The reverence extended to trees is said to be derived from the ancient Maori legend of the love of *Rangitana*, God of the Heavens, and *Papatua*, Goddess of the Earth. Among their children was *Tane*, God of Light and Father of the Forests. *Tane* caused the trees and shrubs and plants to grow to increase the beauty of his mother, and the old Maoris believed that every tree was indeed a child of *Tane*.

Whenever a Maori tribe settled down in a new place it was usual for them to think of it as a holy place and to set about the erection of a sacred house. The Sacred House was the principal building of every village, and elaborate carvings were used to decorate it. The central supports, or life poles, of the house consisted of carved poles of tremendous size. An excellent picture of such a sacred house is to be found on the 2d. value of New Zealand's current issue. Although the reproduction necessarily is on a very tiny scale, the intricacy and grotesque beauty of the exterior carvings is plainly to be seen.

Mata Atua, a splendid example of a Maori house, was the principal feature of the Maori village at the British Empire Exhibition at Wembley in 1924/5 and will have been seen by many of our older readers. This building was constructed in 1874 by Maoris of the east coast of New Zealand. It was 79 ft. 6 in. in length, 41 ft. in breadth and 22 ft. in height, and was presented to the British Government in 1881. Owing to the difficulty of accommodating so large a building it lay in sections in the basement of a London Museum until 1921, when it was handed back to the New Zealand Government for exhibition at Wembley.

We have said that many of the Maori carved statues were of considerable size, and it is interesting to know that often these were actually cast in carved wooden moulds from molten lava or a sacred mud known as *One-Pu-Ehu*, similar to Nile mud taken from under water. Another material that was frequently used in casting statues was volcanic earth taken from the sides of volcano craters and mixed with sea water.

There is an example of such a statue in the form of a dog seated on the rocks in the Bay of Plenty, in the *Ure-Wera* country. This has been in position for more than 600 years. At high water it is covered, but at low water it stands clear. When the wind blows to the south the water in the river rises high and it becomes unfordable. The pressure of wind and water sweeps dangerous fish up the river, but the wind blowing round the hollow cliffs makes a noise like a baying dog and served as a warning to the crews of Maori canoes.

It is difficult to do justice to so interesting a subject as Maori native art in a short article such as this, but those readers who care to examine the subject further will find it full of fascination. Indeed, when they have completed their enquiry it is likely that they will wish to study the work of other native races. There is sufficient fascinating material to provide a lifetime's study.

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Complete set of 135 Coronation stamps of Crown Colonies posted on plain or souvenir envelopes as desired to your own address in writing (not typescript) direct from each Colony.

50/- per set. Used, off cover, 37/6.
Mint set 27/6.

As above but including stamps to 3d. value from any other Colonies not yet announcing Coronation stamps.

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Send for detailed list of individual Colony prices mint and used.

My original arrangements for the posting of the expected definitive series of **King Edward VIII** stamps give you this unique opportunity.

If you prefer to place your order through your regular dealer, do so with pleasure, but be sure to ask him for the **complete set posted direct to you** per the only dealer who can offer this service.

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THE MURDER PACKET FREE

This unique packet contains stamps bearing the heads of **Murdered persons only. RUSSIA** (Czar), murdered in a cellar. **ITALY,** Romulus and Remus (one killed the other); Cæsar (stabbed). **JUGO-SLAVIA,** special mourning stamp for King Alexander (who was shot). **4 CHINA,** Martyrs issue—Teng-Keng and his three compatriots (all were assassinated). **GREECE,** Rigas Feros (poet, killed by the Turks). **U.S.A.,** President Lincoln (shot in a theatre). Absolutely **FREE.** All you have to do is to send 1½d. postage and ask for approvals. Senders of collectors' addresses receive 6 Persia or 6 Venezuela free. 100 British Cols., 1/–; 20 Airpost, 6d.; 6 Triangular, 6d.; 20 Brazil, 8d.; 1,000 different, 3/11, 10 newly issued Pictorials, 6d.

H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET.

CORONATION STAMPS

To be issued May 12th, 1937.

Set of 135 stamps ... ... **£1 4s. 6d.**
Representative set of 45 (one stamp from each of the 45 Colonies) ... ... **4s. 6d.**
Postage extra. Cash with order.
Note: After March 31st, the price for the set of 135 will be increased to **£1 7s. 6d.**
Full list free on application. **Order Early.**

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SUDAN 20 Piastres (S.G.46A) ... ... at **2/-**
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H. L. GOMM, 41, Upper Cranbrook Rd., Redland, Bristol, 6.

CORONATION FIRST DAY COVERS

I am the only one to offer First Day Covers singly from the various Colonies.
All the following will be posted direct from the Colonies to yourself on specially printed souvenir envelopes.
Remember the present prices of Jubilee First Day Covers. Don't leave it until it is too late. Send your order now.
Complete sets with First Day Postmark.

BASUTOLAND, 1d., 2d., 3d. ... ... **9d.**
BECHUANALAND, 1d., 2d., 3d. ... ... **9d.**
BRITISH GUIANA, 2c., 4c., 6c. ... ... **9d.**
CEYLON, 6c., 9c., 20c. ... ... **9d.**
CYPRUS, ⅜p., 1½p., 2½p. ... ... **9d.**
GRENADA, 1d., 1½d., 2½d. ... ... **9d.**
JAMAICA, 1d., 1½d., 2½d. ... ... **9d.**
KENYA, 5c., 20c., 30c. ... ... **9d.**
MALTA, ½d., 1½d., 2½d. ... ... **8d.**
NEWFOUNDLAND, 2c., 4c., 5c. ... ... **9d.**
NIGERIA, 1d., 2d., 3d. ... ... **9d.**
NORTHERN RHODESIA, 1½d., 2d., 3d. ... ... **9d.**
NYASALAND, ½d., 1d., 2d. ... ... **6d.**
ST. LUCIA, 1d., 1½d., 2½d. ... ... **9d.**
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SWAZILAND, 1d., 2d., 3d. ... ... **9d.**
SOUTH AFRICA, in pairs (English and Afrikaans), ½d., 1d., 1½d., 3d., 1/- **4/-**
SOUTH-WEST AFRICA, in pairs (E. and A.), ½d., 1d., 2d., 3d., 4d., 6d., 1/- **6/9**

Many others to offer as soon as information is received.

Single stamps of any of the above supplied at 50 per cent. over face.
Specimen envelope and full particulars free on request.
All orders must be received by March 25th. **Cash with order.**
CORONATION STAMPS: Complete sets, mint, from 45 Crown Colonies, 135 stamps ... Price **24/6** post free.

K. HUMPHRIES, Dept. M, East Wittering, Chichester, Sussex

KING EDWARD VIII PACKET FREE!

This **Wonderful** Packet contains **TWO fine New KING EDWARD VIII** stamps from **Morocco Agencies;** Large **PARAGUAY AIR MAIL Pictorial;** Old **NATAL (O.V.);** Large **Indian JUBILEE** Pictorial; **Transvaal (K.E.);** Large **Dutch JUBILEE** Pictorial; Old **Cape of Good Hope;** China **Sun Yat Sen;** Fr. Peace; **HONG-KONG (K.G.);** etc. **ALL FREE** to those enclosing 1½d. postage and **requesting** our **BARGAIN** appros. of **Large Pictorials, etc.** (No stamps sent abroad.)

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A. V. TAPP, 26, WINDSOR ROAD, BRISTOL, 6.

5 VENEZUELA
3 GUATEMALA
10 BRIT. COLS. } **FREE**

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CORONATION ISSUES

Now booking complete sets of 135 of the Special Coronation Issues for the Crown Colonies, due in May. Price **26/6.** Write for particulars. Prices of Dominion sets later.

KING EDWARD VIII

The set of 4 values King Edward G.B. overprinted for use in Morocco, unused, sent free to all genuine applicants for approvals enclosing 2d. postage.

CANADA JUBILEE

Sets of 6, showing Princess Elizabeth, King George VI, King George V and Queen Mary, King Edward VIII, Windsor Castle, and yacht Britannia. Cat. 4/2, price 2/6

R. D. HARRISON - ROYDON - WARE

See also other stamp advertisements on pages 182, xix and xx

Stamp Gossip

and Notes on New Issues

U.S. Heroes Commemorated

The first pair of a new series of commemorative stamps to be issued by the U.S.A., commemorating outstanding naval and military figures of bygone days, has just made its appearance. One of the stamps is an army stamp and the other a navy stamp.

The army stamp is illustrated here and shows portraits of George Washington and Nathaniel Greene superimposed on a view of Washington's home at Mount Vernon.

The history of Washington is so well known that we need not repeat it here but General Greene is perhaps not quite so well known. He was one of the heroes of the War of Independence, and was at the head of the Southern army that drove the British General, Lord Cornwallis, out of the Carolina States and Georgia.

The Navy stamps show Captain John Paul Jones and John Barry, the latter of whom has gone down in history as "The Father of the U.S. Navy."

Barry had a rather remarkable career and might be said to have founded the craze for being the first to achieve this and that or the other. In 1776, when commanding the U.S. *"Lexington"* he captured the first British ship ever taken by the Americans. He had the honour of being the first officer commissioned by Congress in the Navy, and later in 1794 he became the first commodore of the U.S. fleet.

John Paul Jones was the more romantic figure of the pair, however, for he carried the War of Independence into British home waters. He sailed his ship within gunshot of Dublin. His most famous ship *"Bon Homme Richard"* is illustrated on the stamp with Barry's *"Lexington."*

Finnish Red Cross Stamps

The recently issued Finnish Red Cross charity stamps are notable for the interest of their designs, each of which depicts an old time sailing ship.

There are three stamps in the series, a 1½m. value, illustrated here, showing the *"Uusimaa,"* an old galley fitted with auxiliary sails, and 2 m. and 3½ m. values showing respectively the sailing ships *"Turunmaa" and "Hameenmaa."*

Coronation Stamps

The Colonial Office have officially announced that it has been decided to issue special Coronation commemorative stamps throughout the British Colonies, and to cancel the arrangements that had been made for the Colonies to issue as Coronation stamps two or three low values of their new permanent issues.

The special Coronation stamps will be on sale from 12th May to 31st December and will be of the same shape and size as the 1935 Silver Jubilee issues. They will be printed in single colours by the recess process. Each of the 45 Colonies will use the same design for all stamps, and this will consist of a composite portrait of King George VI and Queen Elizabeth in a setting of Coronation emblems including the Crown, Orb, Sword of State and Sceptres. The date of the Coronation will be inscribed across the top of the design, and the name of the Colony will appear at the foot with value tablets in the bottom corners.

It is anticipated that each of the Dominions also will issue special Coronation stamps, and an official announcement to this effect has been made by the Postmaster-General of Canada, the Hon. J. C. Elliott. Mr. Elliott also said that a new permanent issue bearing a portrait of King George VI will be placed on sale before the Coronation. Southern Rhodesia, South Africa and South West Africa also have announced their intention of making special Coronation issues, and it is certain that Australia and New Zealand also will mark the occasion.

No official news is yet available concerning the new permanent issues of King George's reign but it is not anticipated that the Colonial issues will appear before January next.

Another Cocos Island Map

The famous Treasure Island of the Pacific more correctly known as Cocos Island, is featured once again on stamps in Costa Rica's new issue and appears on both the 5c. and 10c. stamps, the design for which is illustrated here.

"Gibbons Stamp Monthly" draws attention to an interesting feature of the stamp in suggesting that this is another case of philatelic plagiarism. The vessels shown on either side of the Island are none other than the fleet of Columbus. The *"Santa Maria"* appears on the right of the stamp in a setting identical with that on the 3c. of the U.S.A.'s 1893 Columbus commemorative issue. On the left the *"Nina"* and the *"Pinta"* are shown in settings identical with those given on the 4c. stamp of the U.S. 1893 issue.

Peruvian Pictorial Issue

The new postal and air mail stamps issued in December last by Peru include a most interesting range of designs illustrating many of the outstanding features of Peruvian history, geography and commerce.

The postal series contains eight stamps, from which we illustrate the 2c. value showing a cormorant guarding its nest in an area of guano deposit. The remaining designs are as follows: 4c. petroleum well; 10c. an Inca postal runner; 15c. Paseo de la Republica, Lima; 20c. National History Museum and Municipal Palace, Lima; 50c. University of San Marcos, Lima; 1s. G.P.O., Lima; 2s. portrait of Manual de Amat y Junyent; 5s. portrait of J. A. de Panda y Riva, the founder of the Peruvian Post Office; 10s. portrait of Jose Davilla Condemarin.

The air mail stamps number 13 and the designs are as follows: 5c. La Mar Park; 15c. SS. *"Inca"* on Lake Titicaca, the highest navigable lake in the world, over 11,000 ft. above sea level; 20c. native flute player and llama; 30c. Chuquibambilla sheep; 35c. portrait of Jorge Chavez, the pioneer Peruvian airman, in the cockpit of his aeroplane; 50c. a mining area; 70c. aeroplane over La Punta; 80c., illustrated here, a gorge in the Andes; 1s. La Cuma section of Central Peruvian Railway; 2s. air mail plane; 5s. valley of the River Inambari; 10s. portrait of St. Rosa de Lima, the patron saint of the Americas.

A specially interesting feature of these stamps is that in each case a descriptive tablet is included in the design to explain its features. This tablet can be seen in the bottom left corner of the 80c. stamp illustrated here. The view is of a gorge in the Andes and the tablet explains that this is a mountain region of great attraction to tourists, linked to the coast by aeroplane services, railways and roads.

French Winter Sports Issue

We illustrate this month the very striking stamp issued by France to commemorate this year's competitions of the International Ski-ing Federation, held at Chamonix.

The stamp shows a ski jumper taking a big leap and bears appropriate inscriptions.

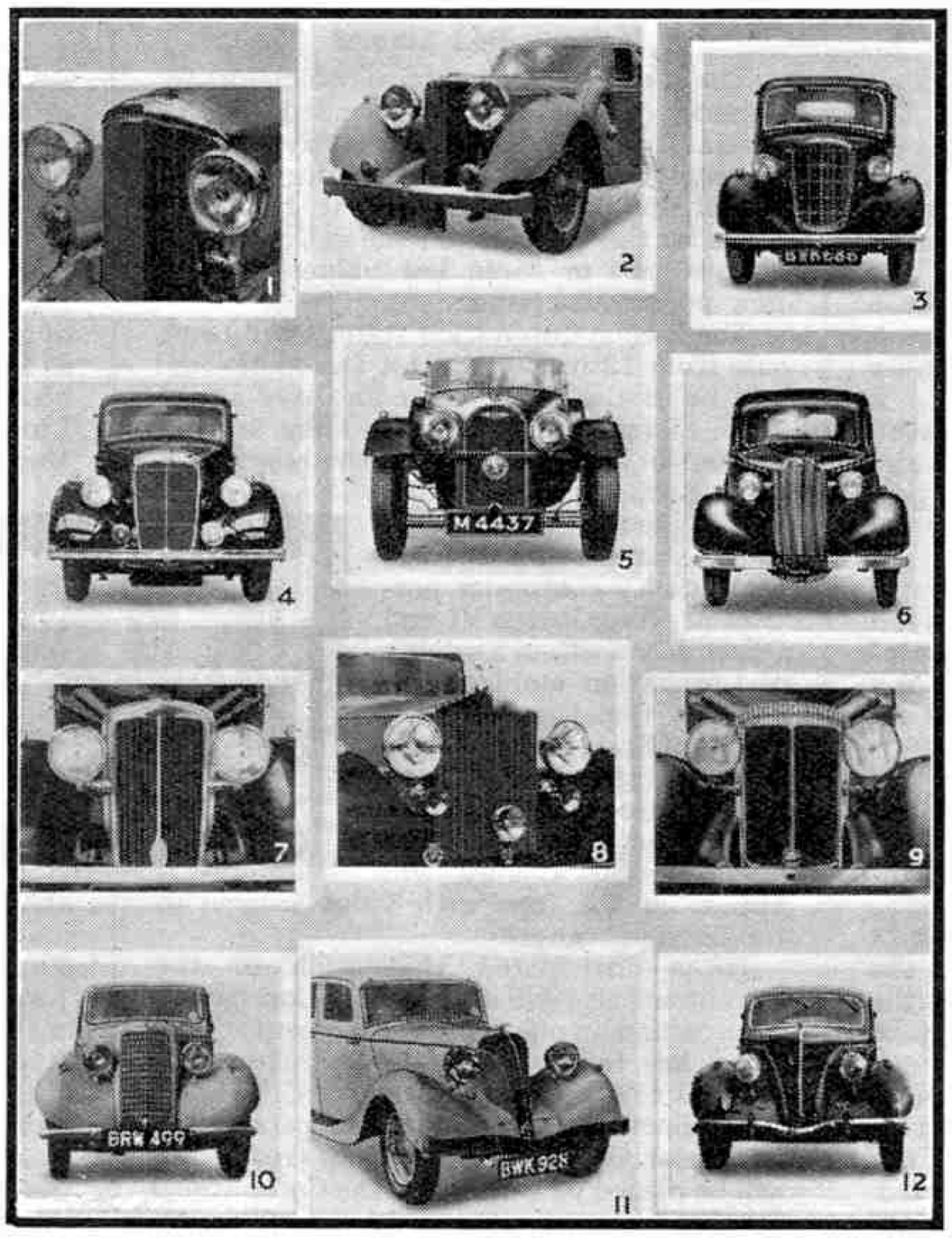
We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations on this page have been made.

Competition Corner

CAR "FACES" VOTING CONTEST

Every make of motor car has its own lines and features and the expert has only to glance at one to recognise it. Front views are particularly distinctive. Radiators differ in shape and slope as well as size. The flow of the wings and the design and spacing of the lamps, horns and other accessories also vary, and the "face" of a car, in fact, is its most individual feature as far as appearance goes.

Our competition this month is concerned with differences between the faces of twelve well-known makes of car. These are shown in front view in the illustration on this page, and numbered from one to twelve, they are Bentley, S.S., Singer, Morris, Morgan, Vauxhall, Lanchester, Rolls-Royce, Daimler, Hillman, Triumph, and Ford, respectively. Readers are asked **A**, to tell us which of the twelve car fronts they consider is the most attractive, and **B**, to forecast the order of popularity of the twelve cars as decided by the massed opinions of all our readers.



For simplicity of reference, the views should be referred to by the numbers marked on them and it must be emphasised that only the car front features, that is those shown in the illustrations, must be taken into account in preparing entries. Competitors need not place their own choice at the head of list B if they do not think it likely to prove a general choice. They must place it where they think it will stand in the popular opinion.

Prizes of Meccano products value 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the entries that most accurately forecast the final order of popularity. In addition there will be a number of consolation prizes. Should there be a tie for any of the prizes, preference will be given to the entry displaying the neatest and most novel presentation. No competitor may submit more than one effort.

Entries must be addressed to "Car Faces Voting Contest, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st March. Overseas readers are invited to take part in the special Overseas Section of this contest. The prizes in this section will be the same in value and number as in the Home Section. Entries to the special Overseas Section must arrive not later than 30th June.

March Drawing Contest

This month's contest will be the last of our winter series of drawing and painting competitions and we hope that every one of our artist readers will take part.

The conditions of the competition are exceedingly simple. Competitors may submit drawings of any subject they like and in any size. Paintings, in oils or water colours, are eligible.

The entries will be divided into two sections, A, for those from readers age 16 and over, and B, for those from readers under 16. Prizes of Meccano products to be chosen by the winners to the value of 21/– and 10/6 respectively will be awarded in each section. In addition there will be a number of consolation prizes.

Entries should be addressed "March Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 31st March. Overseas closing date 30th June.

Competition Closing Dates

HOME		
Car "Faces" Voting Contest	...	**31st March**
March Drawing Contest ...	...	**31st March**
OVERSEAS		
Advertisement Jig-Saw Contest	...	**31st March**
Christmas Shopping List Contest	...	**31st March**
December Drawing Contest	...	**31st March**
"Animalesques" Contest ...	...	**30th April**
Broken Resolutions Contest	...	**30th April**
January Drawing Contest ...	...	**30th April**
Price Codes	...	**31st May**
February Drawing Contest...	...	**31st May**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

Entrants to drawing and similar competitions should note that unsuccessful entries can only be returned if a stamped addressed cover is sent with the entry.

COMPETITION RESULTS

HOME

January Drawing Contest.—First Prizes: Section A, J. E. A. Burley (Birmingham, 6); Section B, K. Clark (Alnwick). Second Prizes: Section A, F. C. Rothery (Devonport); Section B, A. R. Jackson (Hull). Consolation Prizes: P. Cox (London, N.W.11); P. M. Ross (Doncaster); J. E. Simpson (Sunderland).

Broken Resolutions Contest.—1. F. A. Naunien (London, S.W.). 2. B. R. Thompson (Harrow). 3. K. Barltrop (Enfield, Middx.). 4. D. Warnes (Buckie, Banffshire).

"Animalesques" Contest.—1. H. H. Nalder (Rugby). 2. P. Brown (Malton). 3. J. V. G. Moir (Haslemere). 4. A. B. Powell (Stoke-on-Trent). Consolation Prizes: G. W. Judge (Chatham); K. Costain (Bolton); W. W. J. Deeks (London, S.E.6); P. Lacy (W. Ewell); C. Ward (Leeds, 6); C. B. Gale (Newcastle-on-Tyne); B. G. Hawkins (Hanwell, W.7); A. G. Gass (Whitehaven); E. F. Francis (Hainault); L. W. Chitty (London, S.W.20).

OVERSEAS

October Crossword Puzzle.—1. F. Griscti (St. Julians, Malta). 2. C. Baker (Russell, N.Z.). 3. H. Merryweather (Edmonton, Canada). 4. D. R. White (Bangalore, S.I.).

October Drawing Contest.—First Prizes: Section A, J. Rodriguez (Montreal); Section B, R. J. Dickison (Dunedin). Second Prizes: Section A, C. Cali Corleo (St. Julians, Malta); Section B, L. Lawson (Cape, S.A.). Consolation Prize: J. Dalsen (Transvaal, S.A.).

WANTED: A BED

One night a poor man said to Cohen: "Can you give me sixpence for a bed?" and Cohen said: "Sure, where is it?"

* * * *

Recruiting Sergeant: "You must stand six feet in your socks to join our regiment."

Yokel: "Goodness! and how many heads must I have in my hat?"

* * * *

Policeman to Lady Driver in traffic jam: "Use your noodle, lady! Use your noodle."

Lady: "My goodness! Where is it? I've pushed and pulled everything in the car."

* * * *

New Resident: "By the way, does this city boast of a choral society?"

Postman: "Well, I can't say as that we boasts of it. We just suffers in silence."

* * * *

A fellow has to be a contortionist to get on these days. First he has to keep his back to the wall and his ear to the ground. Then he must put his shoulder to the wheel, keep his nose to the grindstone, keep a level head and have both feet on the ground.

* * * *

Smith: "I stopped a smash-and-grab raid last week."

Brown: "That's fine; you must have plenty of nerve."

Smith: "The brick hit me instead of the window."

* * * *

Teacher (to class): "What is the highest form of animal life?"

Brilliant Pupil: "The giraffe, sir."

* * * *

Father: "Why is it that you are always at the bottom of the class?"

Johnny: "It doesn't make any difference daddy, they teach the same things at both ends."

* * * *

Scotsman: "How much to take me to Piccadilly?"

Taxi Driver: "Two shillings."

Scotsman: "How much extra for my baggage?"

Driver: "Baggage free."

Scotsman: "Here, take my baggage, I'll walk."

* * * *

"Waiter, send this ham back. It may have been cured, but it's had a relapse."

* * * *

Teacher: "Can you tell me a thing of importance that did not exist 100 years ago?"

Willie: "Me."

* * * *

"How did you loose your hair?"

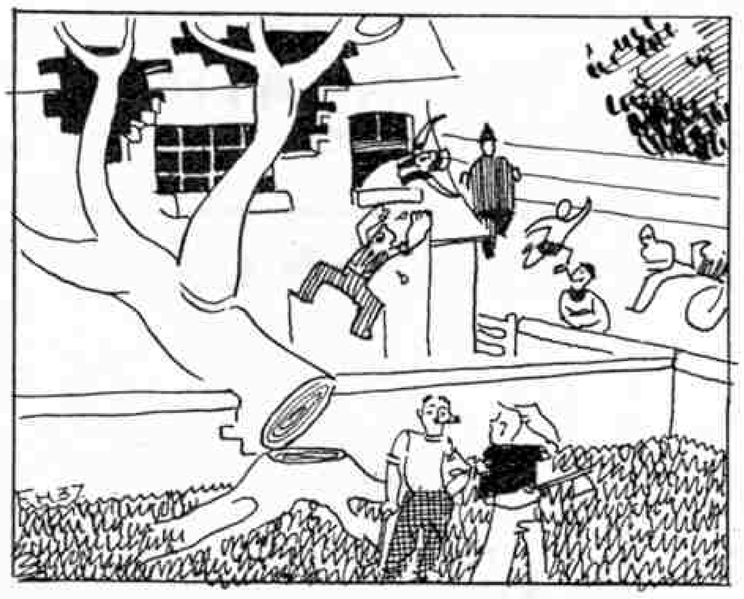
"Worry."

"What did you worry about?"

"Losing my hair."

* * * *

A TRUNK CALL



Two amateur woodsmen were felling a great tree, when suddenly it fell with a crash right against a neighbouring house.

"By gum, we've done it now, Bill," said one.

"Aye," said the other. "It looks as though we'd better ring them up and apologize."

CHILDISH IGNORANCE!

Teacher received her pay envelope and, after extracting the money, held it up for the class to see.

"What is this, Freddy Wilson?" she asked, by way of a general knowledge test.

"A pay envelope, miss," said the boy.

"And what did it contain?" she went on.

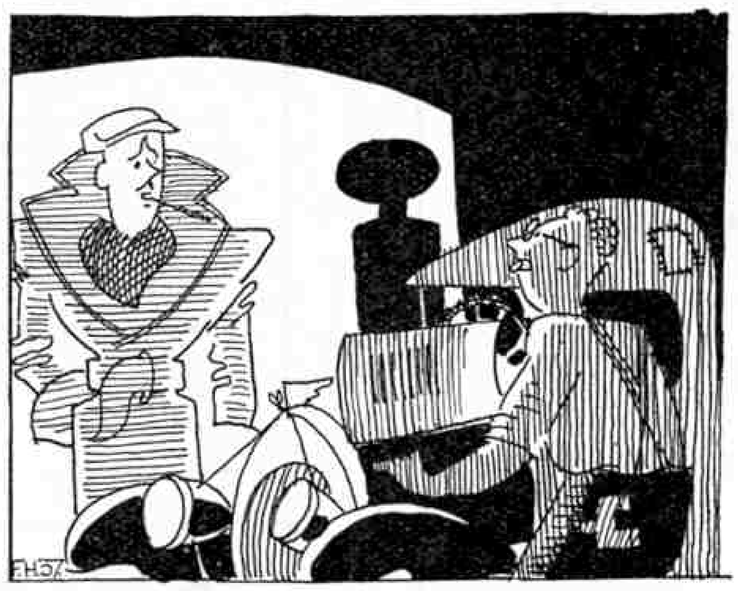
"Money," said Freddy. "Your salary."

"Any questions to ask about it?" teacher asked.

"Please, teacher," said a little boy who had been studying the envelope in silence, "where do you work?"

* * * *

TACTLESS



Jones had taken his car to a garage for minor repairs.

"You wouldn't think it was a second-hand car, would you?" he remarked to the mechanic.

"Great Scott, no!" exclaimed the mechanic. "I thought you'd made it yourself."

* * * *

Motorist, after accident: "Where am I?"

"In number twenty-four."

"Oh, house, ward, or cell?"

* * * *

Counsel (cross-examining): "How often do we find people searching for a gas leak with a naked light?"

Witness: "Just once."

* * * *

Motorist (stopped for dangerous driving): "Constable, what I know about motoring would fill a book."

Constable: "Yes, but what you don't know would fill a hospital."

* * * *

Pat (to foreman): "If you use my idea, no one will be late."

Foreman: "What is your idea? It sounds good."

Pat: "Let the last man blow the whistle."

* * * *

A woman who was known for her meanness telephoned to the Employment Exchange and asked the manager if he could find her a chauffeur.

"The man I employ must be strong, straight in every way, sharp, tough as steel, and . . . . ."

"Pardon me, madam," interrupted the manager, "I think it's a screwdriver you want, not a motor driver."

* * * *

Distraught mother to son being chased by bull: "Georgie, Georgie, for pity's sake run round in circles and make him giddy."

* * * *

Jock had been to London for the first time in his life. Meeting a friend, the latter asked him how he had enjoyed himself.

"Aye, mon," said Jock, "it was foine; every time I went into ane o'thae restaurants I found tuppence or thruppence under ma plate."

* * * *

"Run away, my lad!" growled the unsuccessful angler.

Small boy: "No offence, sir. I just wanted to say that father keeps a fish shop near the station."

* * * *

Bill: "What is meant by the saying of Hobson's Choice?"

Jack: "Er—why, Mrs. Hobson, of course."

PREPARED

"Johnny! Johnny!" said the minister as he met an urchin one Sunday afternoon carrying a string of fish. "Do these belong to you?"

"Ye-yes, sir; you see that's what they got for chasin' worms on Sunday."

* * * *

Interested Passenger (to porter): "I see there are two engines on this train; is that necessary?"

Porter: "Oh, one of them's working back."

Passenger: "And the other one working forward, I suppose?"

* * * *

"Johnnie, what are you up to now? What are you looking in the mirror for with your eyes closed?"

"I just want to see what I look like when I'm asleep."

* * * *

"There was the lion," the traveller said, "and here was I. Just over there was a solitary tree. I dashed toward it, but as I approached, I realised that the lowest branch was quite 20 ft. from the ground, so I jumped for it."

"And did you reach it?" queried a listener.

"I missed it going up," said the traveller, "but I grabbed it as I came down."

* * * *

Landlady: "I'll give you three days in which to pay your board."

Lodger: "All right, I'll pick August Bank Holiday, Christmas and Easter."

* * * *

Little Willie looked nervously in at the kitchen door and saw his Mother resting after a heavy washing day.

"Are you feeling tired, Mother?" he asked.

"Yes, son," she answered, "I can hardly lift my hand, I'm that tired."

"Then I want to tell you that I've lost the shilling change from the store," said Willie.

* * * *

Tiny child in post office: "I want to see the dicky birds."

Mother: "There aren't any here."

Child: "Yes there are, I can see the cage."

* * * *

Jock: "I want one spur."

Saddler: "Why one? We sell them in pairs."

Jock: "If I can get one side of the horse to go, then the other side must go also."

* * * *

Two local tradesmen were discussing business.

"I suppose you have a number of doubtful debts?" remarked the draper.

"I wish I had," replied the tailor, "but there's no doubt about most of them."

* * * *

Sandy: "I want to hire a horse."

Riding Master: "How long?"

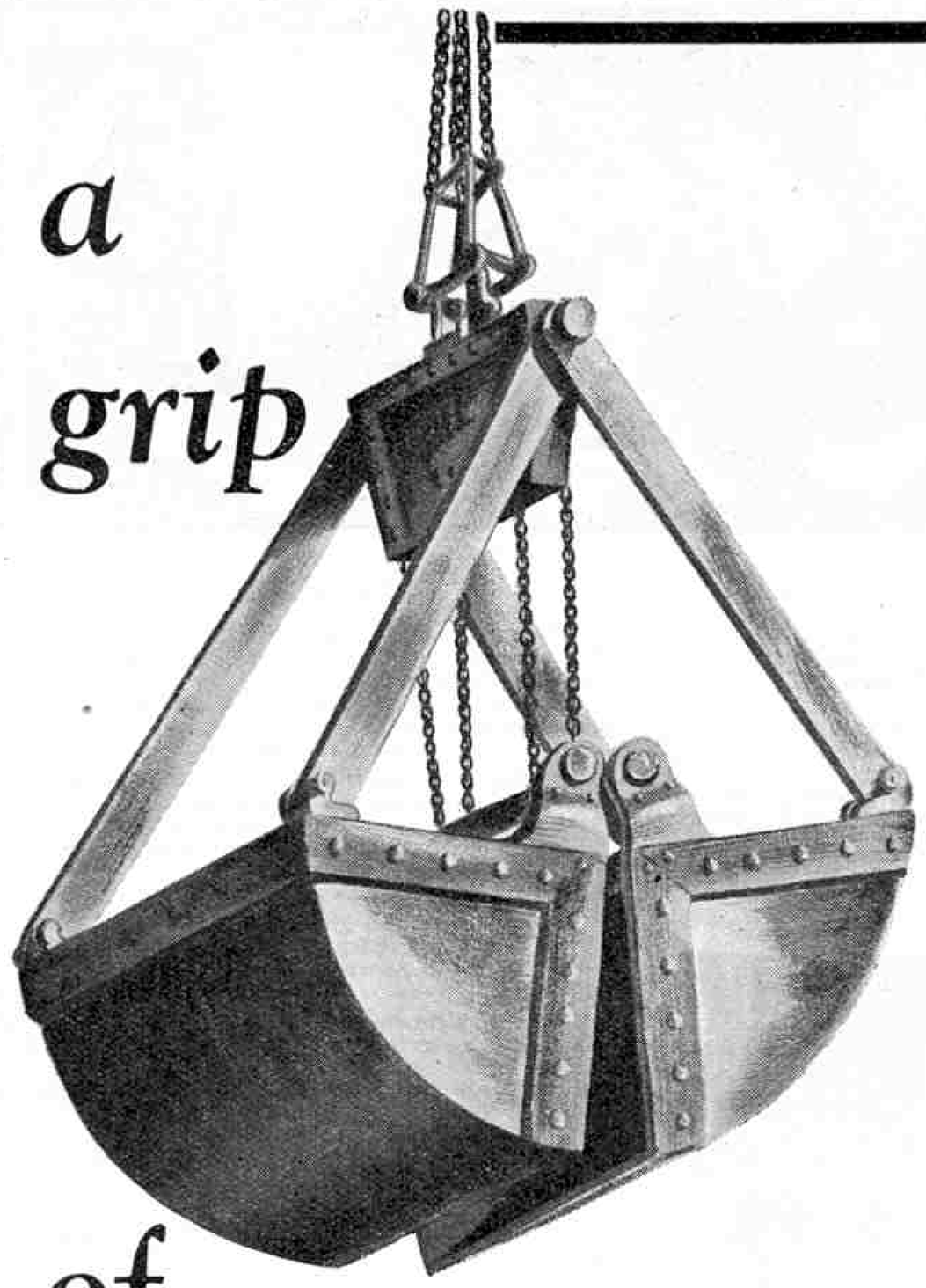
Sandy: "The longest one you have. There are four of us."

* * * *

A CONTINUOUS PERFORMANCE

Farmer-at Flower Show: "We'll just hae oor dinners here, Jeannie. Twa 'oors steady eatin' is no bad fur wan and six."

a grip



of

IRON

Whenever you are faced with the task of "sticking" two surfaces together—use Seccotine. Seccotine sticks articles with colossal strength; and can be used with equal success on practically any surface.

You only need a little Seccotine to make the strongest joint. Simply apply it to the parts to be joined and press them together. When the Seccotine has had time to dry, you can rest assured that it has stuck for good.

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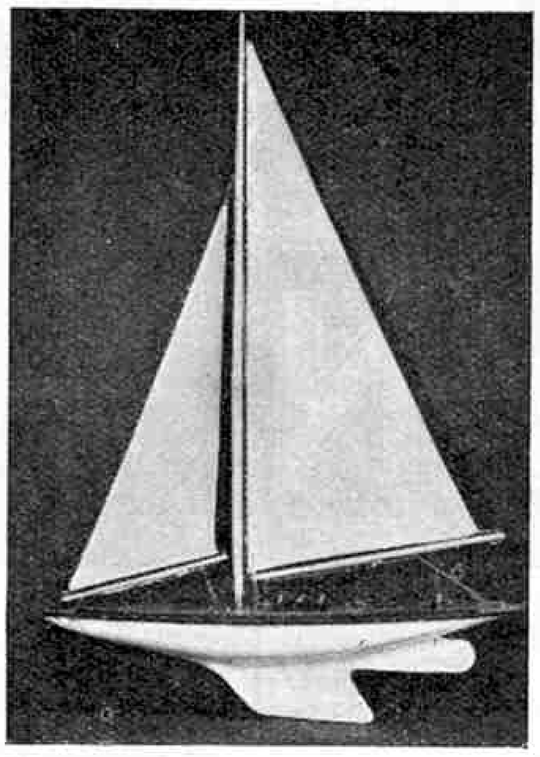

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Will sail in any weather.

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder	11/-
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Send for Bond's 1937 Catalogue, it has 200 pages filled with all types of Locomotives, Boats, Aeroplanes, Tools and Materials and also includes many pages on Model Making. Price **6d.**

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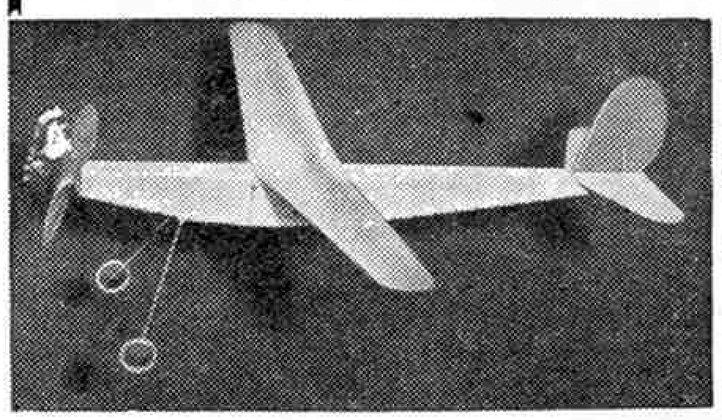
AVIAN ALL BALSA



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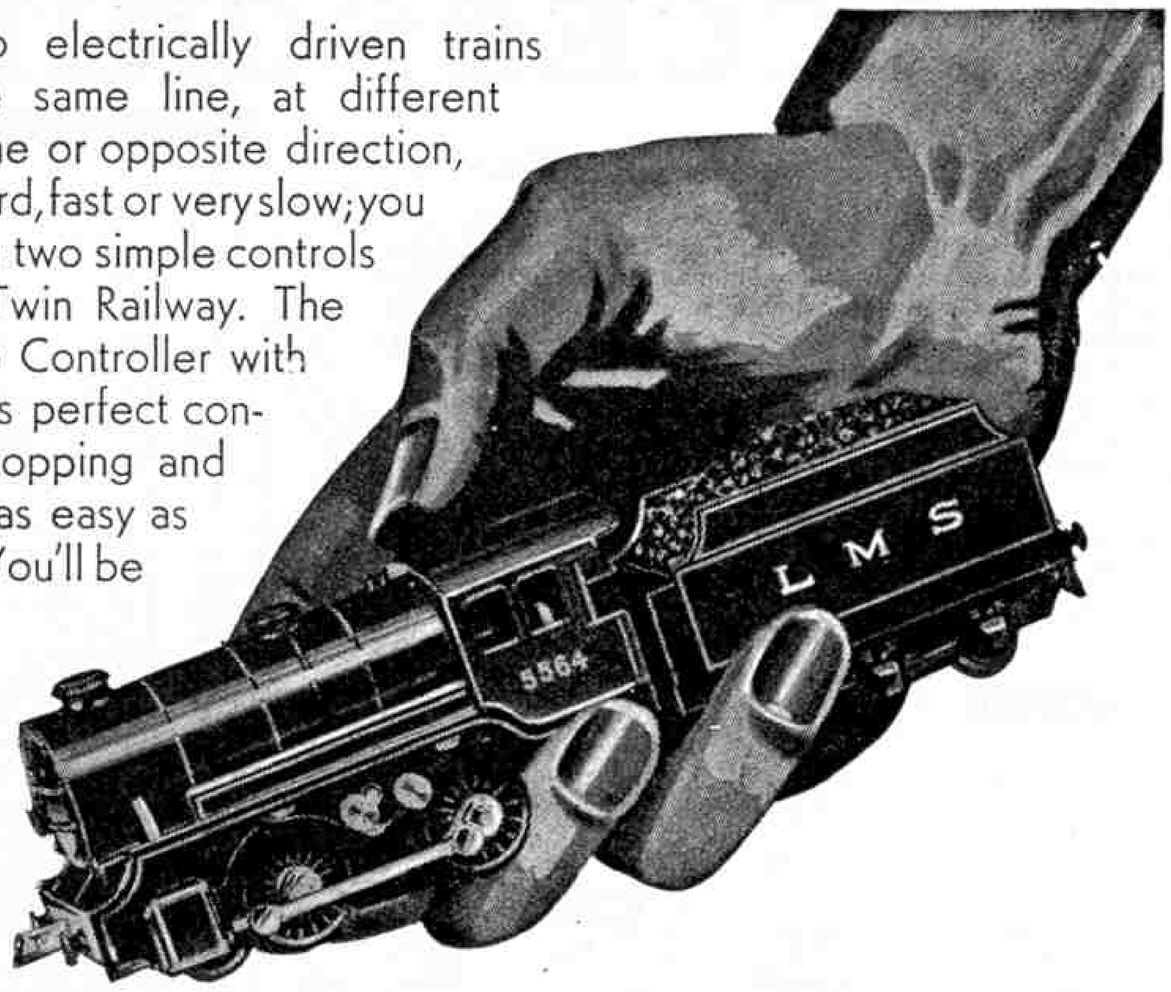
RAVENS TWIN RAILWAY

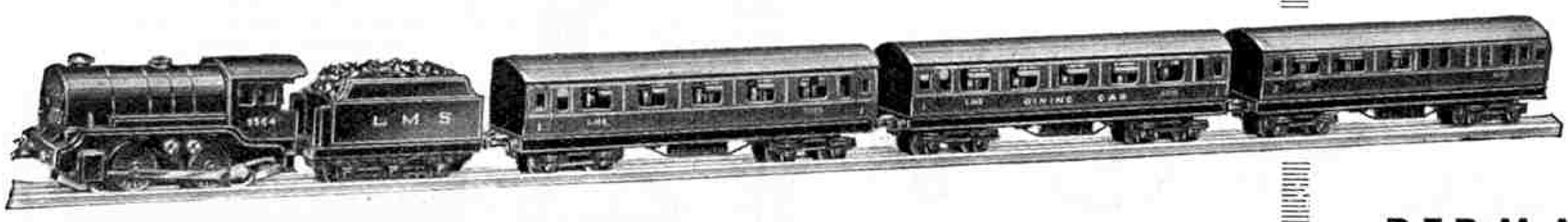
GAUGE OO RADIUS 14"

FOR A.C. MAINS OR ACCUMULATORS

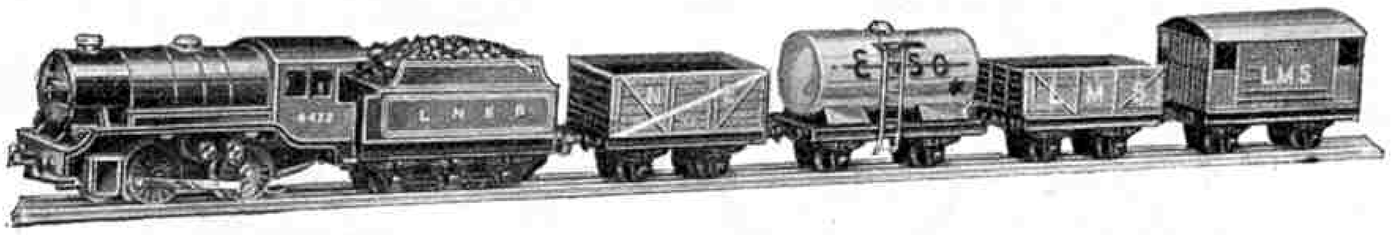


Just imagine two electrically driven trains travelling on the same line, at different speeds, in the same or opposite direction, backward or forward, fast or very slow; you can do all this from two simple controls with a RAVENS Twin Railway. The Special Resistance Controller with safety cut-out gives perfect control for starting, stopping and reversing, it's just as easy as pressing a button. You'll be fascinated too with the automatic couplings fitted on all R.T.R. stock. With these you can marshal Goods and Passenger Trains—just like the real thing. You can have the most elaborate Railway system in only a quarter of the space usually needed, and you'll have twice as many thrills.

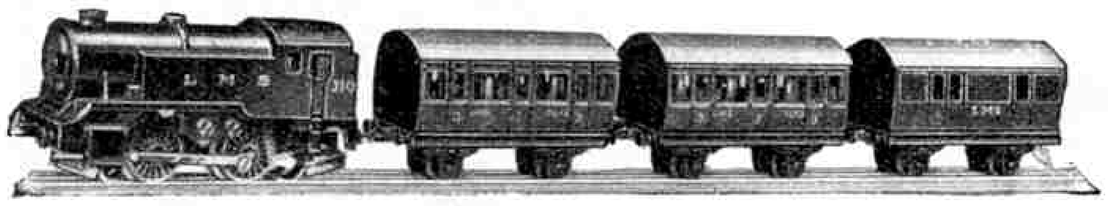
The rails are beautifully mounted on Bakelite bases, making them strong, rigid and impossible to bend. These rails, in fact, set an entirely new standard in track construction. Seeing is believing and nothing that is written here can possibly give a complete idea of their unique qualities and va!ue. You must handle them yourself; see how simply and cleverly they join; how they line up with everything else that is so amazing in this unique Twin Railway from RAVENS.



Express Passenger Set, length 28 in. (as illustrated), with oval track of 16 rails, controller, wire and plugs, full instructions, etc. **Loco and Tender (14/6** alone) in colours, either **L.M.S.** or **L.N.E.R. 45/-** Set.



Goods Set, length 20in. (as illustrated), with oval track of 14 rails, controller, wire and plugs, full instructions, etc. **Loco and Tender (14/6** alone) in black, either **L.M.S.** or **L.N.E.R. 42/-** Set.



Suburban Set, length 14½in. (as illustrated), details as Goods Set above. **Tank Loco (14/-** alone), either **L.M.S.** or **L.N.E.R. 35/-** Set.

(Owing to the varying Electric Supply Systems, Transformers are not included in the Train Sets and should be ordered separately.)

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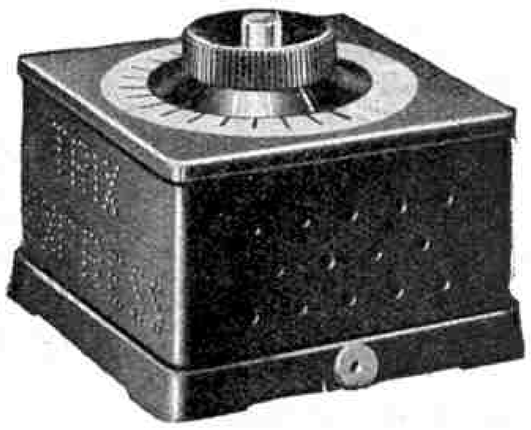

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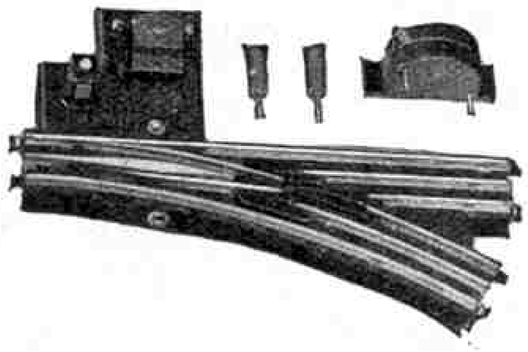

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GAUGE OO. RADIUS 14 in.

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10.	Flat Brackets	doz.	0	1
11.	Double Brackets	„	0	3
12a.	Angle Brackets, 1" x 1"	„	0	6
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1⅛" diam.	„	0	5
20b.	„ „ ¾" „	„	0	3
	Pulley Wheels			
19c.	6" dia. with centre boss and Set Screw	each	1	9
20a.	2" „ „ „	„	0	4
21.	1½" „ „ „	„	0	4
22.	1" „ „ „	„	0	3
23a.	½" dia. with centre boss and Grub Screw	„	0	3
22a.	1" dia. without centre boss and Grub Screw	„	0	2
23.	½" „ „ „	„	0	2
24.	Bush Wheels	„	0	4
26.	Pinion Wheels, ½" dia., ½" face	„	0	4
26a.	„ „ ½" „ ½"	„ „	0	5
26b.	„ „ ½" „ ¾"	„ „	0	6
	Gear Wheels			
27.	50 teeth to gear with ¾" pinion	each	0	5
27a.	57 „ „ „ ½"	„ „	0	6
28.	Contrate Wheels, 1½" diam.	„	0	9
29.	„ „ ¾"	„	0	6
30.	Bevel Gears, ⅞", 26 teeth	„	0	7
30a.	„ „ ½", 16 „	„	0	6
30c.	„ „ 1½", 48 „	„	1	6
	(30a and 30c can only be used together)			
31.	Gear Wheels, 1", 38 teeth	each	0	10
32.	Worms	„	0	4
44.	Cranked Bent Strips	„	0	1
45.	Double „ „	„	0	1
46.	„ Angle Strips, 2½" x 1"	½ doz.	0	6
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61.	Windmill Sails	4 for	0	6
77.	Triangular Plates, 1"	each	0	1

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90.	2½" Curved Strips, 2⅜" radius	each	0	1
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle	„	0	1
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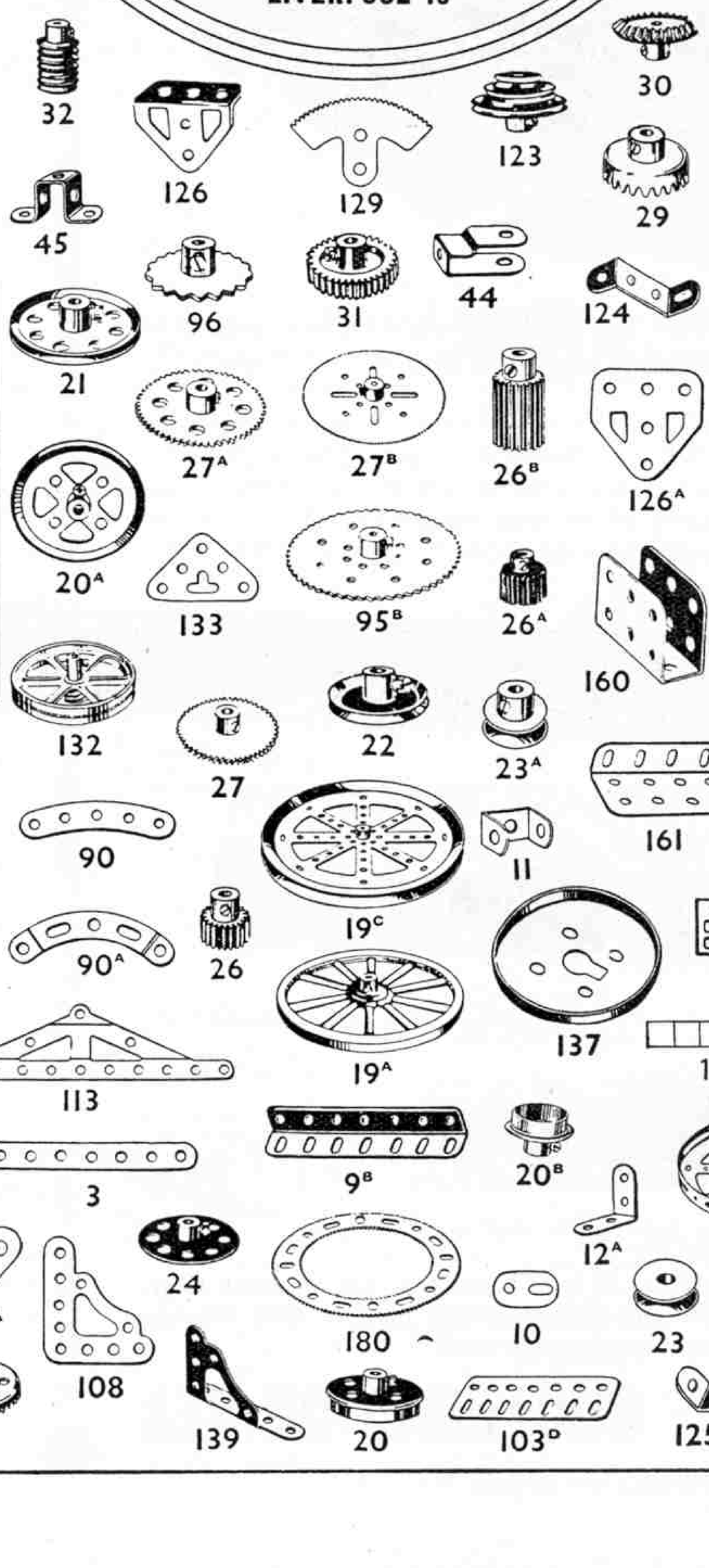
102.	Single Bent Strips	each	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	7
108.	Architraves	doz.	1	6
110.	Rack Strips, 3½"	each	0	2
113.	Girder Frames	„	0	3
118.	Hub Discs, 5½"	„	1	3
123.	Cone Pulley	„	1	3
124.	Reversed Angle Brackets, 1"	½ doz.	0	4
125.	„ „ „ ½"	„	0	2
126.	Trunnions	pair	0	3
126a.	Flat Trunnions	each	0	1
129.	Rack Segments, 3" diam.	„	0	5
132.	Flywheels, 2¾" diam.	„	2	0
133.	Corner Brackets, 1½"	„	0	1
133a.	„ „ 1"	„	0	1
137.	Wheel Flanges	„	0	3
139.	Flanged Brackets (right)	„	0	2
143.	Circular Girders, 5½" diam.	„	1	0
145.	Circular Strips, 7½" diam. over all	„	0	9
147.	Pawls, with Pivot Bolt and Nuts	„	0	3
148.	Ratchet Wheels	„	0	6
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	6
154b.	Corner Angle Brackets, ½", left hand	„	0	6
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½"x1"x½"	„	0	2
161.	Girder Brackets, 2"x1"x½"	2 for	0	3
167.	Geared Roller Bearings	each	20	0
168.	Ball Bearings, 4" diam.	„	3	0
170.	Eccentrics, ½" throw	„	0	9
180.	Toothed Gear Ring, 3½" diam. { 133 external teeth, 95 internal „ }	„	2	0



ANNOUNCING!

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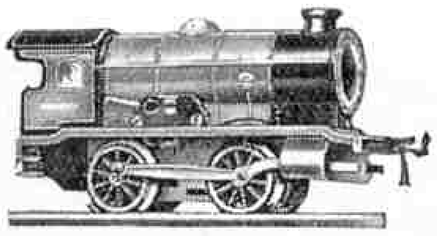

EM120 (20-volt) or EM16 (6-volt) LOCOMOTIVE
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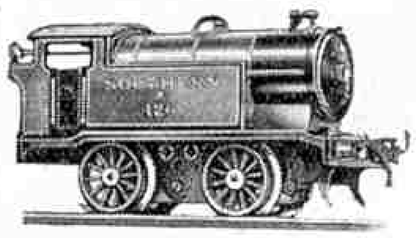

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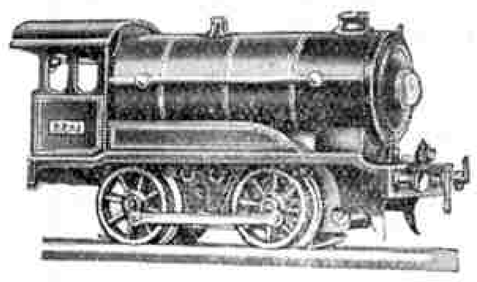
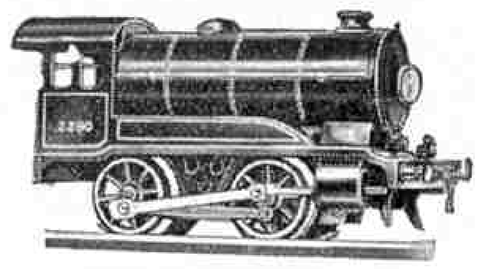
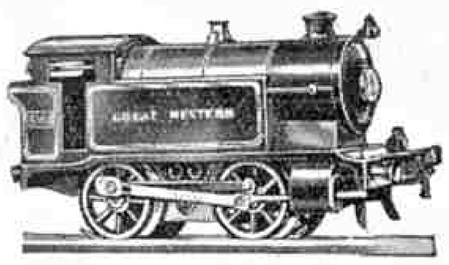


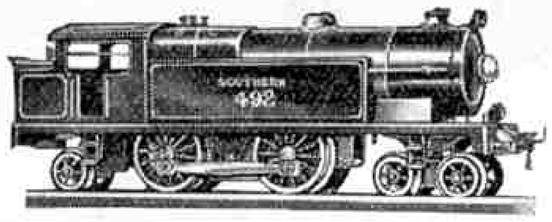
***HORNBY EO20 (20-volt) LOCOMOTIVE**
Reversing ... ... Price 22/–



***HORNBY E120 (20-volt) LOCOMOTIVE**
Reversing . . ... Price 24/–



***HORNBY E120 (20-volt) TANK LOCOMOTIVE**
Reversing ... ... Price 24/–



***HORNBY E220 SPECIAL TANK LOCOMOTIVE (20-volt)**
Automatic reversing ... Price 32/6

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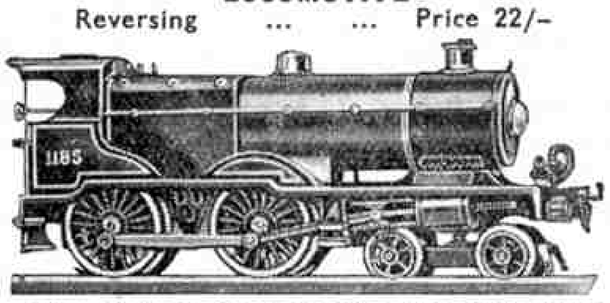
Reversing ... ... Price 30/–



***HORNBY E220 SPECIAL LOCOMOTIVE (20-volt)**
Automatic reversing: L.M.S.R. "1185" ("Standard Compound" class), G.W.R. "County of Bedford" ("County" class), L.N.E.R. "The Bramham Moor" ("Hunt" class), S.R. "1759" ("L1" class) ... ... Price 37/6

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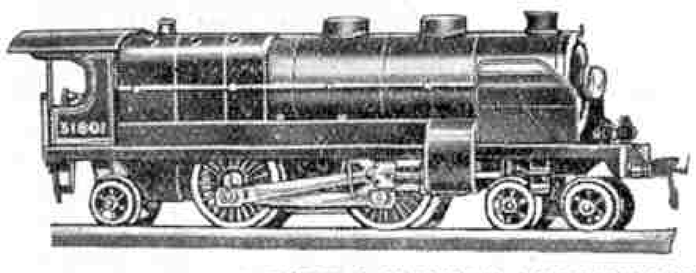
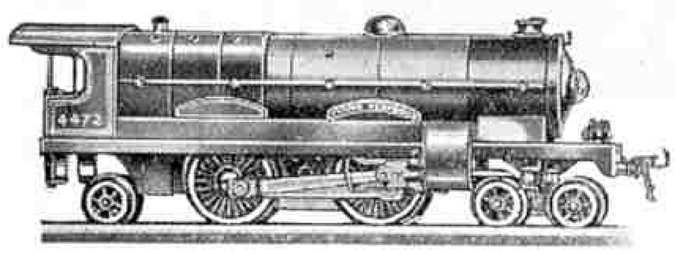
Automatic Reversing. Price 30/–



HORNBY E320 RIVIERA "BLUE" LOCOMOTIVE (20-volt)
Automatic reversing ... ... Price 35/–



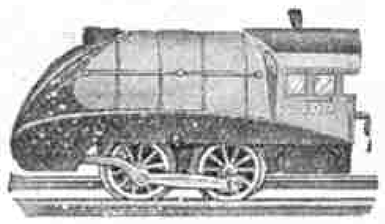
***HORNBY E320 LOCOMOTIVE (20-volt)**
Automatic reversing ... ... Price 35/–

***HORNBY EPM1s SPECIAL TANK LOCOMOTIVE (6-volt Permanent Magnet Type) (illustrated)**
Reversing. Can be run from a 6-volt Accumulator or from the mains through the Meccano Transformer-Rectifier. Complete with a 6-volt Terminal Connecting Plate, Speed and Reverse Control Switch and 3 feet of flex.
Price 33/6

***E120 (20-volt) SPECIAL ELECTRIC TANK LOCOMOTIVE**
Automatic reversing. Price 30/–

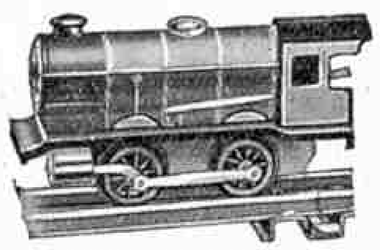
Clockwork Models

Hornby Clockwork Locomotives are the longest running spring-driven locomotives in the world. The motors fitted are of the highest quality, being perfect pieces of mechanism with accurately cut gears that ensure smooth and steady running.

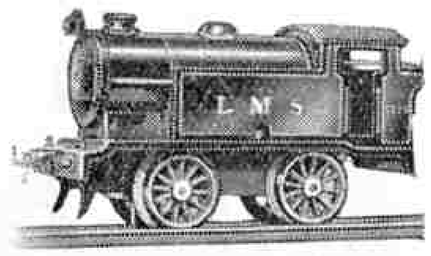


No. 0 "SILVER LINK" LOCOMOTIVE (illustrated)
Streamline Type.
Non-reversing. Price 3/6

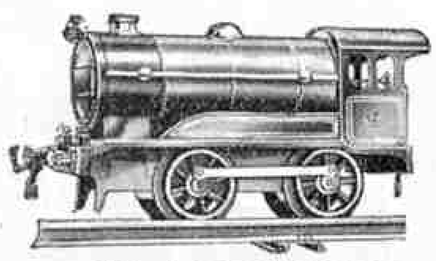
MO CLOCKWORK LOCOMOTIVE
Non-reversing. Available in either red or green. Price 2/9



M1/2 LOCOMOTIVE
Reversing. Available in either red or green ... Price 4/6

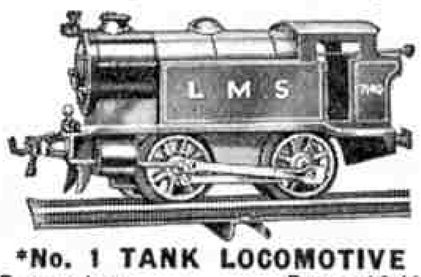


M3 TANK LOCOMOTIVE Reversing. Available in red with L.M.S.R. lettering, or green with L.N.E.R., G.W.R. or S.R. lettering. ... Price 7/6

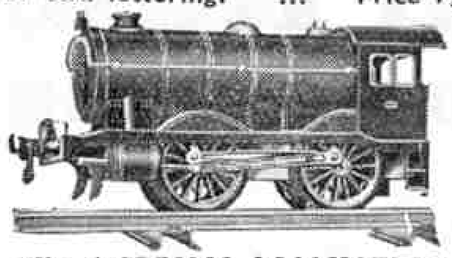


***No. 0 LOCOMOTIVE**
Reversing ... Price 10/6

***No. 1 LOCOMOTIVE**
Reversing ... Price 12/6

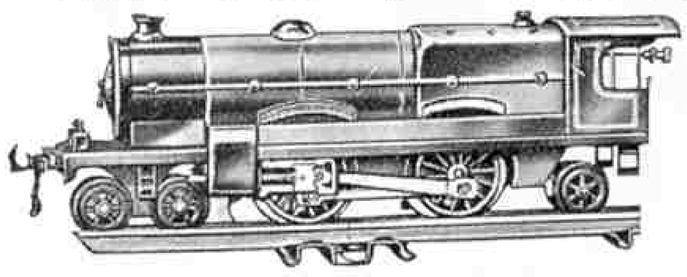


***No. 1 TANK LOCOMOTIVE**
Reversing ... ... Price 12/6



***No. 1 SPECIAL LOCOMOTIVE**
Reversing ... ... Price 17/6

***No. 1 SPECIAL TANK LOCOMOTIVE**
Reversing ... ... Price 17/6

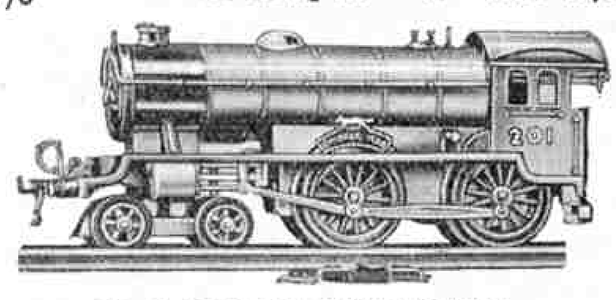


No. 3C LOCOMOTIVE (illustrated)
Reversing. "Caerphilly Castle" (G.W.R.), "Flying Scotsman" (L.N.E.R.), "Royal Scot" (L.M.S.R.), "Lord Nelson" (S.R.) ... ... Price 24/–

No. 3c RIVIERA "BLUE" LOCOMOTIVE
Reversing ... ... Price 24/–

***No. 2 SPECIAL TANK LOCOMOTIVE**
Reversing ... ... Price 21/–

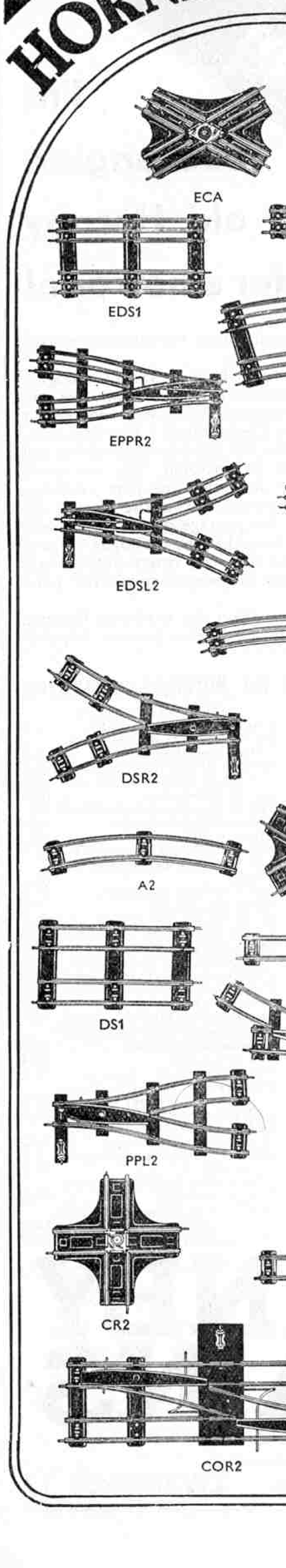
**Lettered and coloured to represent L.M.S.R., G.W.R., L.N.E.R. and S.R. Locomotives.*

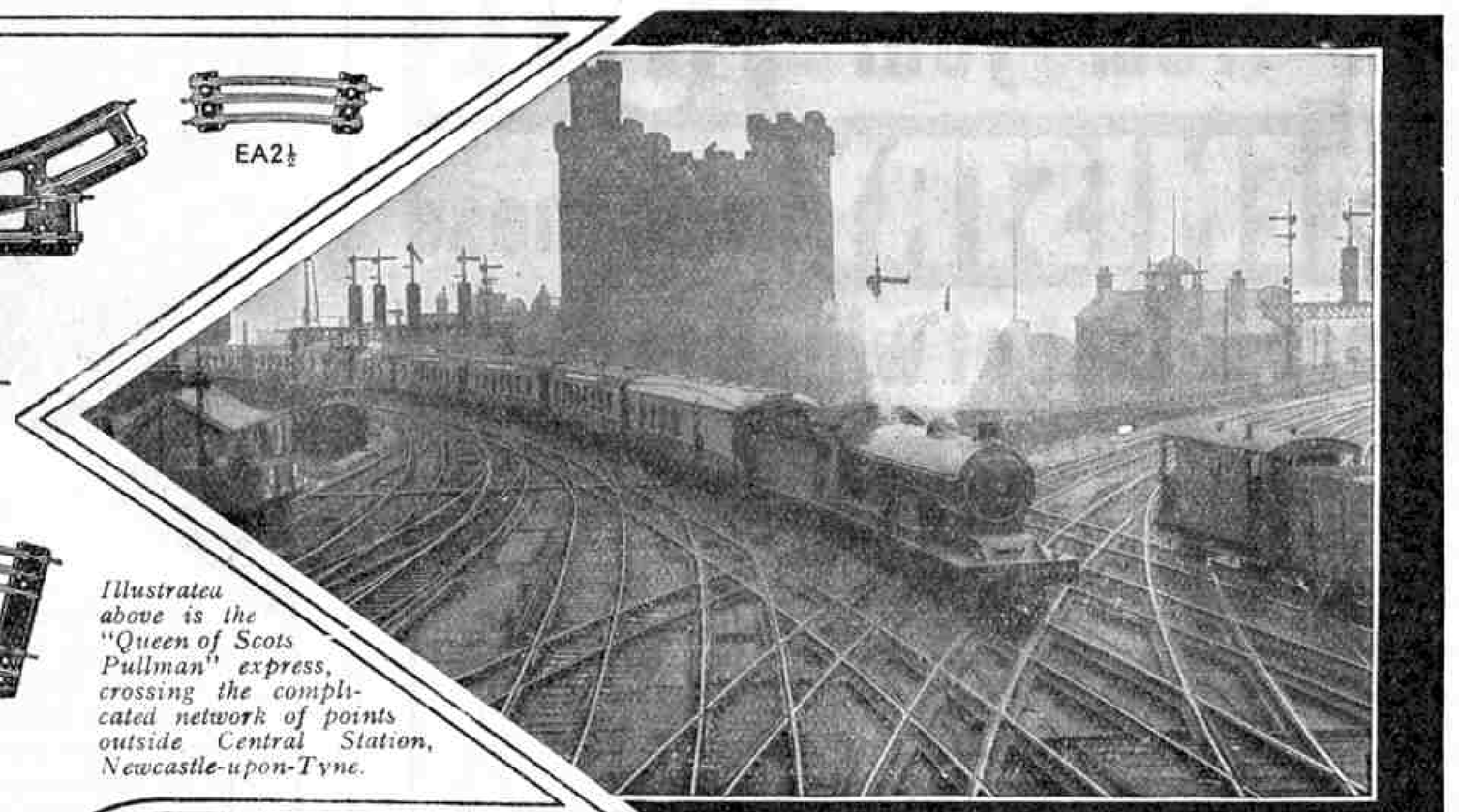


No. 2 SPECIAL LOCOMOTIVE
Reversing. L.M.S.R. No. 1185 ("Standard Compound" class), G.W.R. "County of Bedford" ("County" class), L.N.E.R. "The Bramham Moor" ("Hunt" class), S.R. No. 1759 ("LI" class).
Price 27/6

Manufactured by MECCANO LIMITED, Binns Road, LIVERPOOL 13

HORNBY RAILS, POINTS AND CROSSINGS





Illustrated above is the "Queen of Scots Pullman" express, crossing the complicated network of points outside Central Station, Newcastle-upon-Tyne.

There is practically no limit to the number of rail formations that can be built with Hornby Rails, Points and Crossings. A supply of Rails is included in every Hornby Train Set, but the owner is certainly not getting the best out of his set if he is satisfied with merely running it round a simple oval track. The addition of extra Rails and of Points and Crossings to his equipment lends a delightful realism to the game and greatly enhances the fun.

Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved rails	... ...	... per doz. 5/–
EA1½	Curved half rails	... ...	... „ 4/6
EA1¼	Curved quarter rails	... ...	... „ 4/–

2-ft. Radius

EA2	Curved rails	... ...	... per doz. 5/–
EA2½	Curved half rails	... ...	... „ 4/6
EA2¼	Curved quarter rails	... ...	... „ 4/–
EDC2	Curved rails, double track		... ½ doz. 9/–

STRAIGHT RAILS

EB1	Straight rails	... ...	... per doz. 5/–
EB½	Straight half rails	... ...	... „ 4/6
EB¼	Straight quarter rails	... ...	... „ 4/–
EDS1	Straight rails, double track		... ½ doz. 8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points	... ...	per pair 5/9
EPL1	Left-hand points		

For 2-ft. Radius Curves

ESPSR2	Right-hand points	... ...	per pair 7/6
ESPSL2	Left-hand points		

CROSSINGS

ECA	Acute-angle crossings	... ... each 2/9
ECR	Right-angle crossings	... ... „ 2/9

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand,	
EDSL1	Double symmetrical points, left-hand,	per pair 6/–

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand,	
EDSL2	Double symmetrical points, left-hand,	per pair 7/–

PARALLEL POINTS

EPPR2	Parallel points, right-hand	per pair 7/–
EPPL2	Parallel points, left-hand	

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair 24/–
ECOL2	Crossover points, left-hand	

EMC20	Switch rail (20-volt)	... ... each	1/3
EMC6	Switch rail (6-volt)	... ... „	1/3
TCP20	Terminal connecting plates (20-volt)	„	1/3
TCP6	Terminal connecting plates (6-volt)	„	1/3

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

M9	Curved rails	(9-in. Radius) ...	per doz. 2/6
MB9	Curved brake rails	... ...	each 3d.
A1	Curved rails	(1-ft. Radius) ...	per doz. 3/6
A1½	Curved half rails	„ ...	„ 3/–
A1¼	Curved quarter rails	„ ...	„ 2/6
AB1	Curved brake rails	„ ...	each 4d.
A2	Curved rails	(2-ft. Radius) ...	per doz. 3/6
A2½	Curved half rails	„ ...	„ 3/–
A2¼	Curved quarter rails	„ ...	„ 2/6
AB2	Curved brake rails	„ ...	each 5d.
DC2	Curved rails, double track	„ ...	½ doz. 6/–

STRAIGHT RAILS

BM	Straight rails (for MO Trains)	...	per doz. 2/6
B1	Straight rails	... ...	„ 3/6
B½	Straight half rails	... ...	„ 3/–
B¼	Straight quarter rails	... ...	„ 2/6
BB1	Straight brake rails	... ...	each 4d.
BBR1	Straight brake and reverse rails	...	„ 1/6
DS1	Straight rails, double track	...	½ doz. 5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius track)	... ...	each 1/9
CA2	Acute-angle crossings (for 2-ft. radius track)	... ...	„ 1/6
CR1	Right-angle crossings (for 1-ft. radius track)	... ...	„ 1/9
CR2	Right-angle crossings (for 2-ft. radius track)	... ...	„ 1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points	... ...	per pair 3/–
ML9	Left-hand points	... ...	

For 1-ft. Radius Curves

PR1	Right-hand points	... ...	per pair 3/–
PL1	Left-hand points	... ...	

For 2-ft. Radius Curves

PR2	Right-hand points	... ...	per pair 3/–
PL2	Left-hand points	... ...	
PSR2	Points on solid base, right-hand		per pair 8/6
PSL2	Points on solid base, left-hand		
SPSR2	Points on solid base, right-hand		per pair 5/–
SPSL2	Points on solid base, left-hand		

These points are similar to Points PSR2 and PSL2 but they are not fitted with ground disc or for Hornby Control.

PARALLEL POINTS

PPR2	Parallel points, right-hand	per pair 3/6
PPL2	Parallel points, left-hand	

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double sym. points, right-hand	per pair 3/6
DSL1	Double sym. points, left-hand	

For 2-ft. Radius Curves

DSR2	Double sym. points, right-hand	per pair 3/6
DSL2	Double sym. points, left-hand	

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair 12/–
COL2	Crossover points, left-hand	
RCP	Rail connecting plates	... ... ½ doz. 2d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets "How to plan your Hornby Railway," and "Hornby Layouts—100 Suggestions." Each of these booklets is obtainable from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

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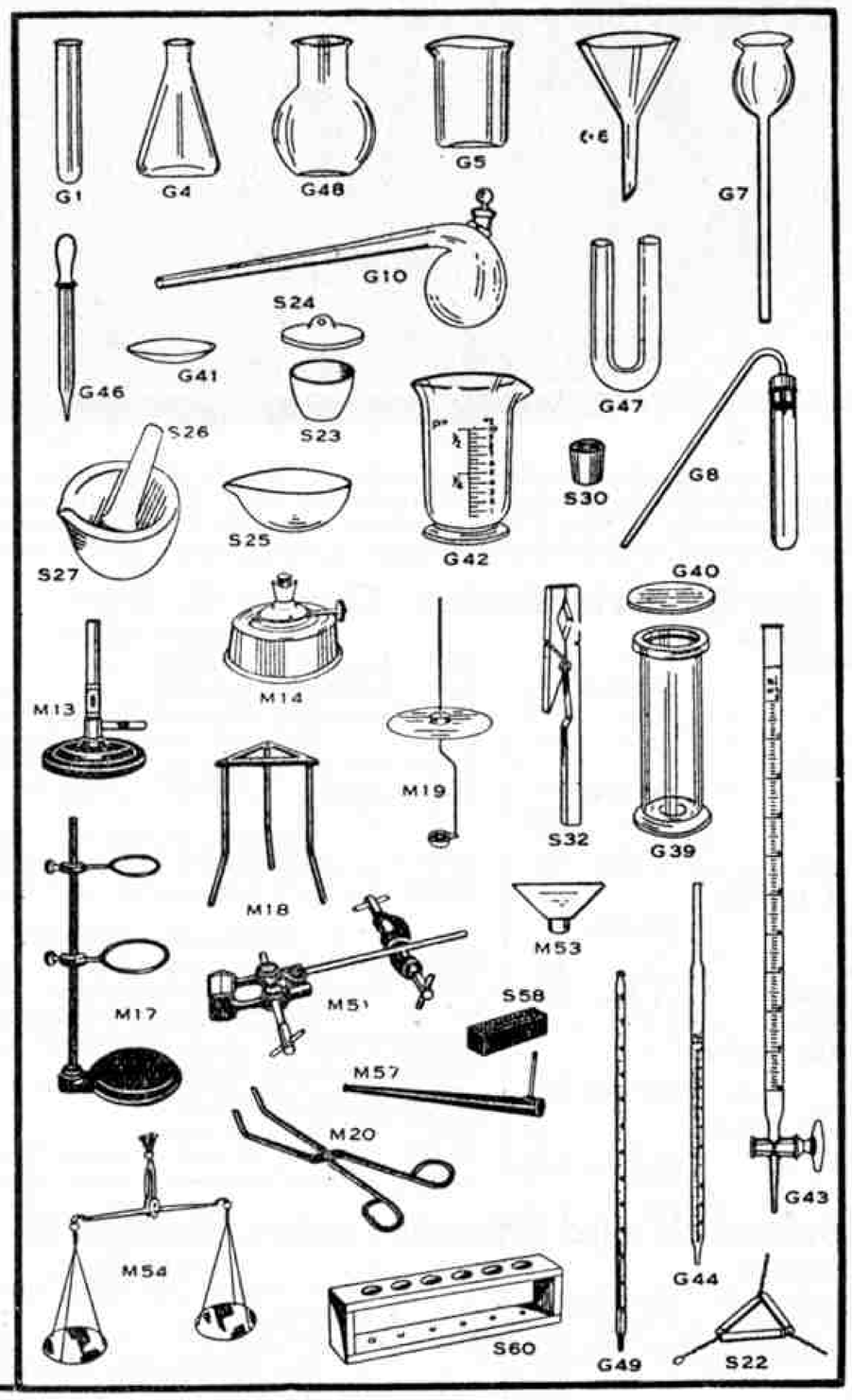

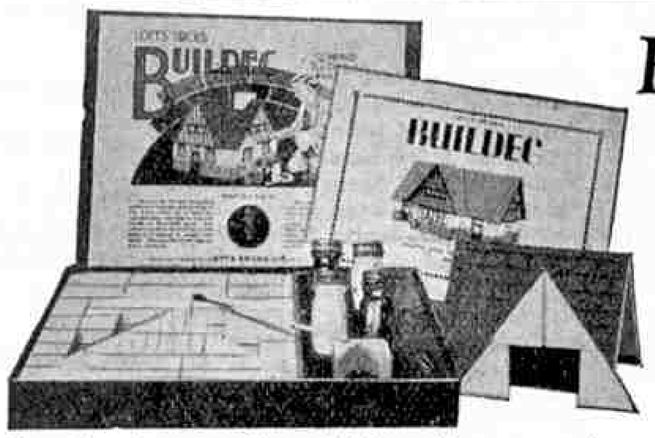

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„ 3, „ „ 36 „ 8 „ „ „ ... 10/6

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I'm exchanging my old Hornby engine for a new one!

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First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

Part Exchange allowances for Hornby Locomotives

CLOCKWORK MODELS	
M2930 Locomotive	1/–
MO Locomotive...	1/4
M1/2 Locomotive	2/3
*George V Locomotive ...	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
LEC 1 Locomotive (Swiss Type)	5/3
Zulu Tank Locomotive... ...	6/3
No. 1 Tank Locomotive ...	6/3
No. 1 Locomotive	6/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 1 Special Locomotive ...	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Locomotive	10/–
No. 2 Tank Locomotive ...	10/6
No. 2 Special Tank Locomotive	10/6
Metropolitan C Locomotive ...	10/6
No. 2 Special Locomotive ...	11/3
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	11/9
No. 3C Locomotive	12/–
No. 3C Riviera "Blue" Locomotive	12/–

**These models were identical.*

ELECTRIC MODELS	
EM16 or EM120 Locomotive ...	4/3
No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
EM36 or EM320 Tank Locomotive	8/3
LST M3/20 Tank Loco (20-volt)	8/3
LE 120 Locomotive	10/–
LE1/20 Loco (Swiss Type) 20-volt	10/–
E06 or E020 Locomotive ...	11/–
E16 or E120 Locomotive ...	12/–
E16 or E120 Tank Locomotive	12/–
LST 1/20 Tank Locomotive (20-volt)	12/–
LST 2/20 Tank Locomotive ...	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive ...	12/6
EPM16 Special Tank Locomotive	13/9
Metropolitan L.V. Locomotive	15/–
E26 Special Tank Locomotive ...	15/–
E36 Metropolitan Locomotive...	15/–
E120 Special Locomotive (automatic reverse)	15/–
No. 2 Electric Tank Locomotive	15/–
E120 Special Tank Locomotive (automatic reverse)	15/–
E36 Locomotive	16/3
E36 Riviera "Blue" Locomotive	16/3
E220 Special Tank Locomotive (automatic reverse)	16/3
LE2/20 Locomotive	16/6
LE220 Locomotive (automatic reverse)	16/6
E320 Locomotive (automatic reverse)	17/6
E320 Riviera Locomotive (automatic reverse)	17/6
E220 Special Locomotive (automatic reverse)	18/9
Metropolitan H.V. Locomotive	18/9

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BRITISH AND GUARANTEED

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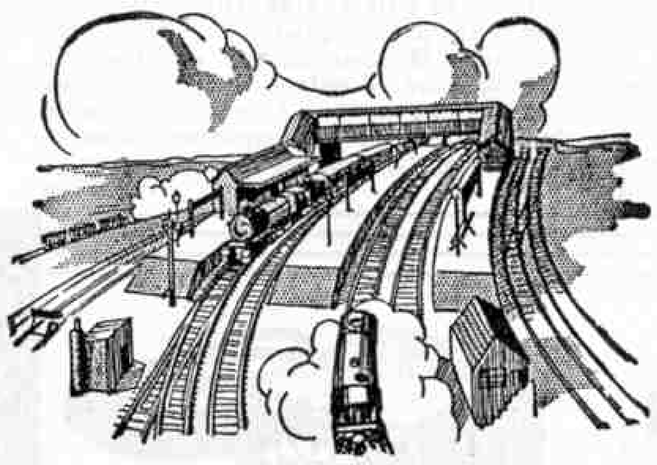

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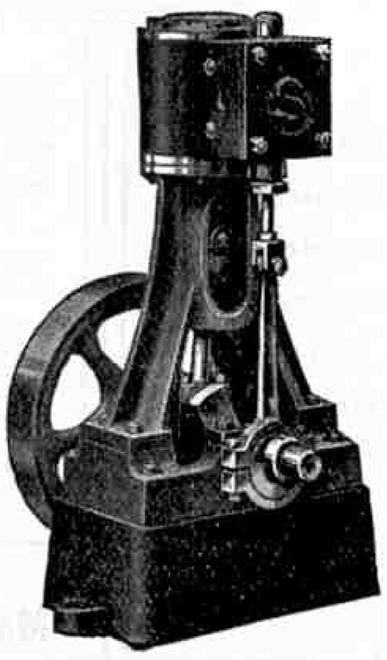

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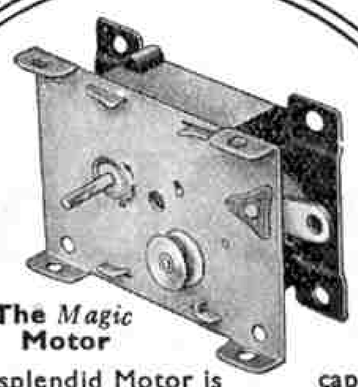

The *Magic* Motor

This splendid Motor is capable of driving models made with Meccano Outfits A, B and C. It costs only 2/–.

MECCANO

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CLOCKWORK MOTORS

The *Magic* Motor (non-reversing)	Price	2/–
No. 1 Clockwork Motor (non-reversing) ...	,,	5/–
No. 1a Clockwork Motor (reversing) ...	,,	7/6
No. 2 Clockwork Motor (reversing) ...	,,	9/–

ELECTRIC MOTORS

No. E1 Electric Motor (6-volt). Non-reversing	Price 9/–
No. E6 Electric Motor (6-volt). Reversing ...	,, 15/6
No. E120 Electric Motor (20-volt). Non-reversing	,, 10/–
No. E20B Electric Motor (20-volt). Reversing	,, 18/6

TRANSFORMERS

The Transformers made by Meccano Limited provide a convenient and safe means of driving 6-volt or 20-volt Electric Motors and Train Sets from the mains supply where this is alternating current.

When ordering a Transformer or a Transformer-Rectifier the voltage and frequency of the supply must be stated. These particulars are given on the supply meter.

No. T6A Transformer (Output 40 VA at 9/3½ volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator and separate circuit for supplying current for eighteen 3½-volt lamps ... ... Price 22/6

No. T6 Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T6M Transformer (Output 25 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. This is similar to No. T6, but is not fitted with a speed regulator... Price 12/6

No. T26M Transformer (Output 50 VA at 9 volts) for 6-volt Electric Motors or 6-volt Trains. Not fitted with speed regulator. Will operate two trains at the same time, either on the same track or on two separate tracks. In the latter case two Resistance Controllers are necessary to give independent control ... ... Price 13/6

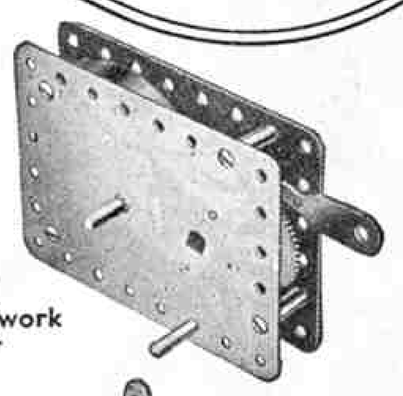
No. TR6 Transformer-Rectifier (Output 6 volts at 1½ Amps.) for use with Hornby No. EPM16 Special Tank Locomotive (6-volt, Permanent Magnet) ... ... Price 29/6

No. T20A Transformer (Output 25 VA at 20/3½ volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator and output sockets for lighting lamps. Price 22/6

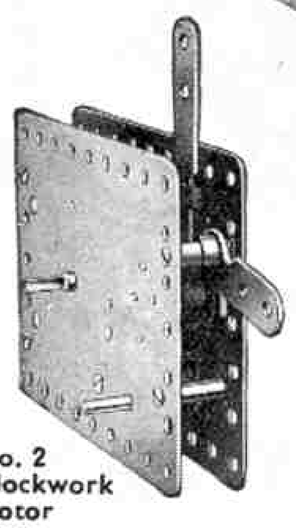
No. T20 Transformer (Output 20 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Fitted with speed regulator ... ... Price 17/6

No. T20M Transformer (Output 20VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. This is similar to No. T20 but is not fitted with speed regulator ... Price 12/6

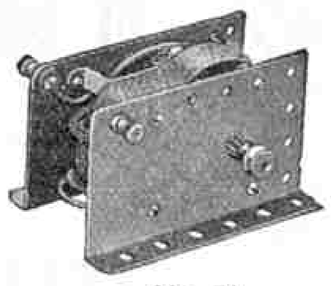
No. T22M Transformer (Output 50 VA at 20 volts) for 20-volt Electric Motors or 20-volt Trains. Not fitted with speed regulator. Will operate two trains at the same time, either on the same track or on two separate tracks. In the latter case two Resistance Controllers are necessary to give independent control ... ... Price 13/6



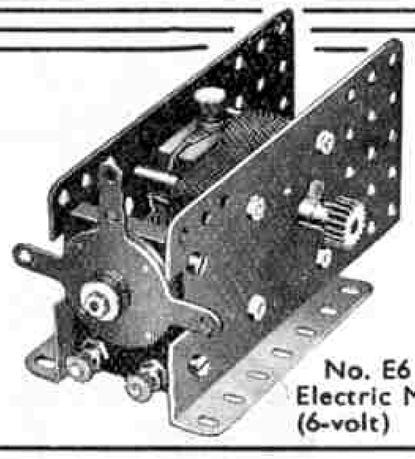
No. 1 Clockwork Motor



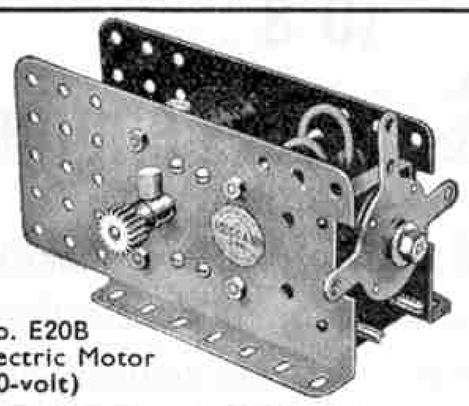
No. 2 Clockwork Motor



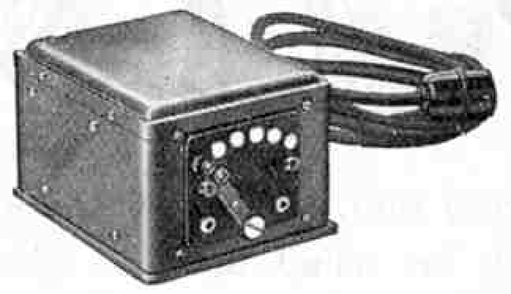
No. E1 Electric Motor (6-volt)



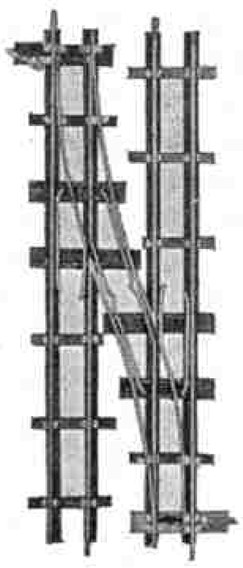
No. E6 Electric Motor (6-volt)



No. E20B Electric Motor (20-volt)



No. T20 Transformer



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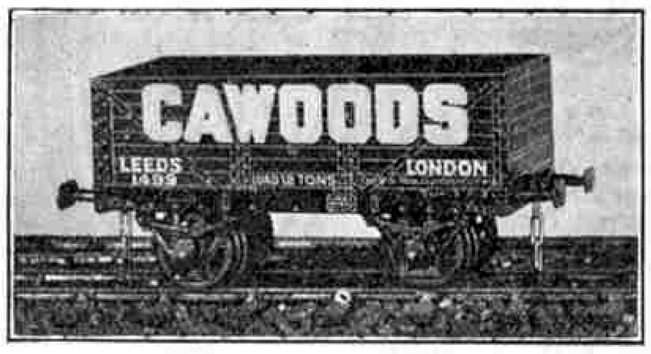

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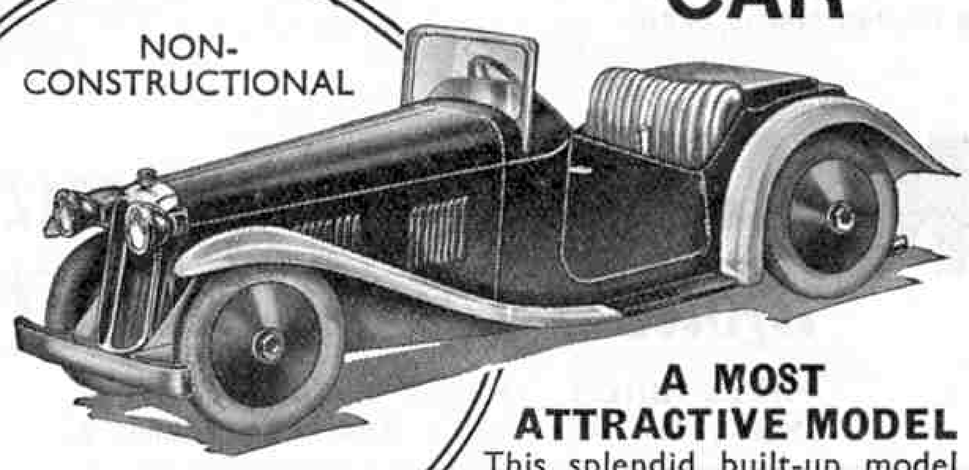

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STAMP ADVERTISEMENTS.
See also pp. 182, 184 and XX.

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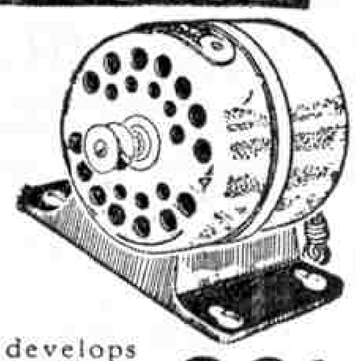

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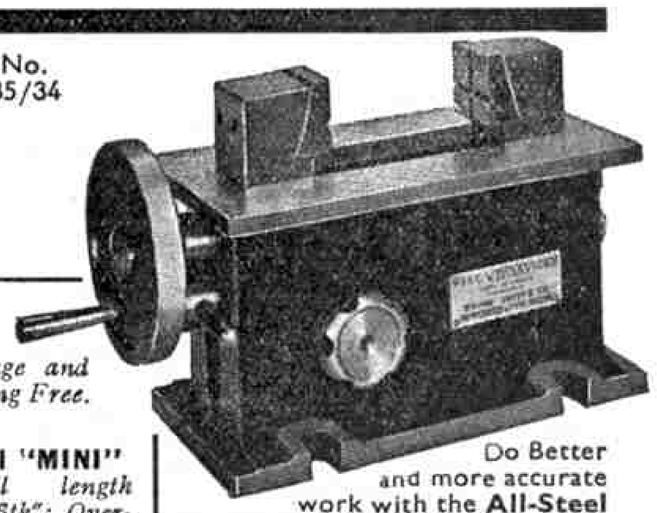

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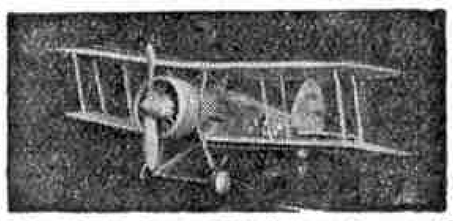

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READERS' SALES

Readers should note that all advertisements of Hornby Trains and other Meccano products included in this column relate to items no longer featured in the catalogue. Advertisements of current products cannot be accepted for this column.

Tame Mice for sale. Lovely pets. Many colours. Only 2/- pair. Cage 1/6 extra.—Walter Bowden, 36, Fore Street, Heavitree, Exeter.

Sale. Silkworm Eggs. Hatch next May. 1/3 100.—Jefferies, 1, Victoria Road, Southall, Middx.

Sale. 25 Boys' Books. List sent on request.—Jones, Arosfa, Corwen, Merioneth.

Sale. "M.M.'s," 1929-1931. "Handicrafts," 1926-1928. "Hobbies Annuals," 1928, 1929. Britain's Soldiers, Guns, etc. Many boys' books.—Daniel, 7, Witham Bank, Boston.

Sale. Large Chemistry Set. 10/- or nearest offer.—F. Girwood, 32, Parkhead Cottages, West Calder, Midlothian.

For Sale. Two collections of Stamps, Stamp catalogue, packet 1,700 duplicates, "Diana" Airgun, 700 Cigarette Cards. Send for list.—"Philatelist," 3, Dawson Road, Birmingham, 21.

Wanted. "M.M.'s," 1933-June 1936 or parcel. Make offer to Salvador, Whittall Han, Istanbul, Turkey.

Seven volumes Cassell's "Children's Book of Knowledge," complete, beautifully bound. Apply—306, Oundle Road, Woodston, Peterborough.

Wanted. Meccano Set 5a, enamelled red-green.—Thomas, 8, Hillside Road, Cheam, Surrey.

Upright Steam Engine. New 25/-. Sell 18/6. Microphone, 7/6.—W. Blythe, Roseworth, Fellside Road, Whickham, Co. Durham.

Sale. Model Railway and Red-Green Meccano material, cheap. Also Pathé Cine Camera, good condition. Stamp particulars.—B. Woodman, 45, Regents Park Road, N.W.1.

(*Readers' Sales continued at foot of next column*).

STAMP ADVERTISEMENTS.
See also pp. 182, 184 and XIX.

½d. APPROVALS. Hoult, Playing Place, Truro.

5 EDWARD VIII MOROCCO 4d. or 11 different 1/6. Sanders, 90, Newlands Avenue, Southampton.

GEORGE VI PACKET FREE. (All Cols.) Write now. Request approvals. G. Kingsmill, New Barnet, Herts.

25 Diff. French Colonials Free. Request approvals. Winter, 89, Cobham Road, Seven Kings.

100 diff. Stamps Free to approval applicants, good discount.—Gosling, 21, Powling Road, Ipswich.

100 Different Stamps Free to applicants for ½d. approvals. Cox, 14, Broadmead Av., Worcester Park.

TRIANGULAR STAMPS, nice selection on approval. Hynds & Son, "Hylands," Eastern Av., Prittlewell.

FREE. Portuguese Packet. Send postage and request approvals. Charlesworth, 119, St. Lukes Road, Blackpool.

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New Approval Sheets ready. Fine variety. New issues, pictorials and others. Good Discount. Write for a selection to-day. Exchange with all Colonies desired.
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1000 UNSORTED UNUSUAL UNKNOWN 1/6
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Room E, Cambridge House, Cambridge Road, Chiswick, LONDON, W.4.

READERS' SALES (*continued from previous column*).

Meccano Magazines, 1931 to 1935. Offers.—Jones, 3, Lon-Isa, Rhiwbina, Cardiff.

Bowman Stationary Engine, perfect, cost 9/6. Any offer accepted. Sexton Blake's, 2d. each.—Barber, 48, Olive Road, Ealing, London.

For Sale. Pound George V Stamp. Light Postmark. Guaranteed genuine. Catalogue 85/-, accept 75/-.—Frankland, Sedbergh, Yorks.

Wireless bargains. Valves, 1/9. Large boxes Wireless parts, 3/9. Blue Spot Speaker, 5/6. 2-valve Set, 11/6. Kloster Brandes Three, powerful, 14/6, both with valves. Stamp list.—60, Avenue Approach, Bury St. Edmunds.

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—
LIVERPOOL 13, ENGLAND.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

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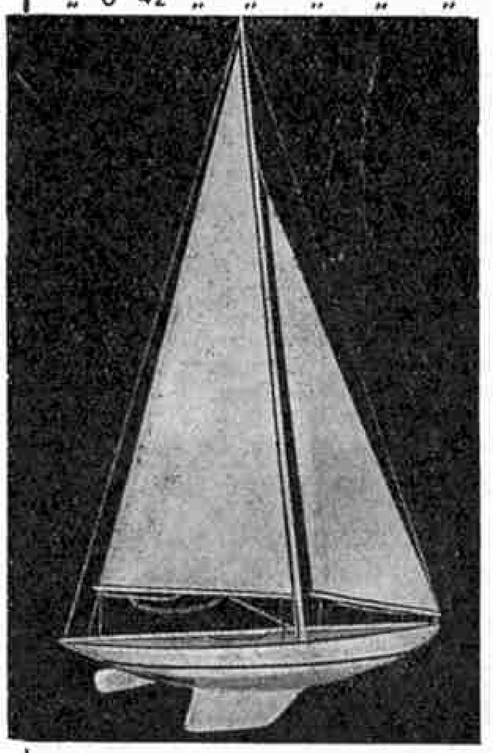

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HORNBY SPEED BOAT No. 1. "HAWK." Price 2/11

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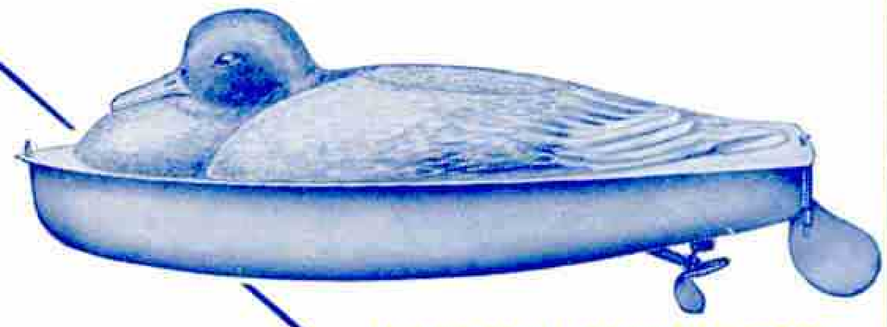
Hornby Water Toy



HORNBY WATER TOY (DUCK). Price 2/6

The deck of this boat carries a realistically moulded model of a Duck, as shown.

Manufactured by
Meccano Ltd.
Binns Road
Liverpool 13

HORNBY SPEED BOAT No. 2. "SWIFT." Price 7/6

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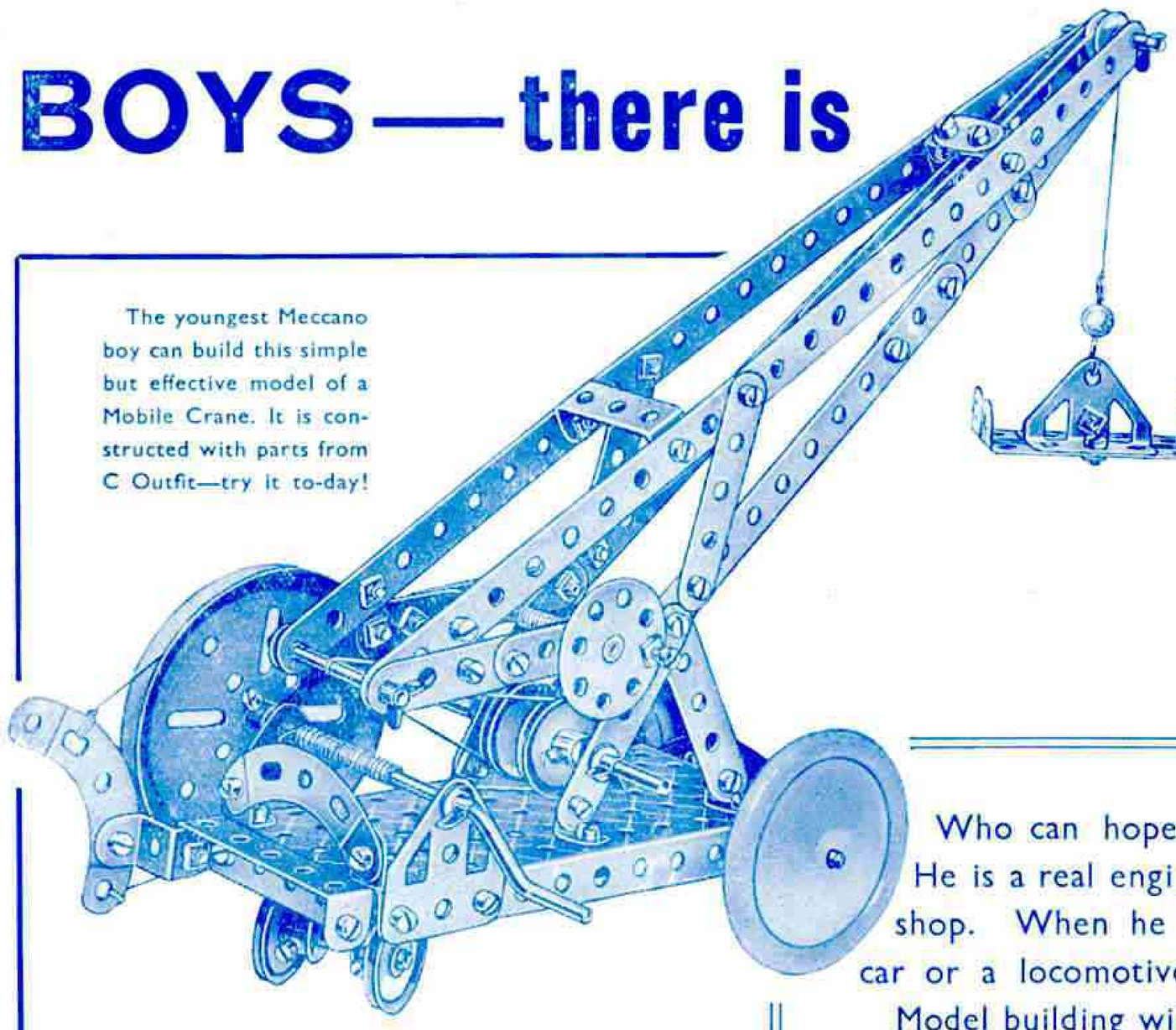
HORNBY LIMOUSINE BOAT No. 4. "VENTURE." Price 15/6

MECCANO

BOYS — there is no limit to the number of models you can build with Meccano!

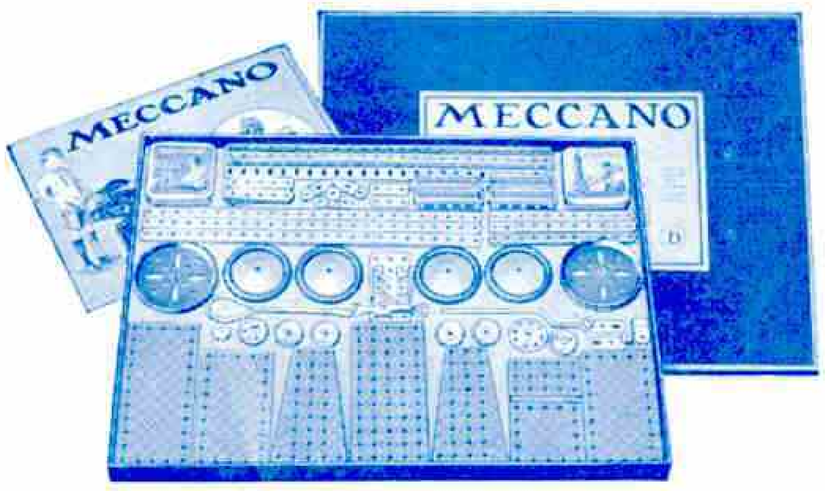


The youngest Meccano boy can build this simple but effective model of a Mobile Crane. It is constructed with parts from C Outfit—try it to-day!

Who can hope to have as many toys as a Meccano boy? He is a real engineer — his playroom is an engineering workshop. When he wants a truck, a crane, a bridge, a motor car or a locomotive he builds one with his Meccano Outfit.

Model building with Meccano is the most thrilling hobby in the world for boys.

A Meccano Outfit. Price 5/-



D Meccano Outfit. Price 15/-

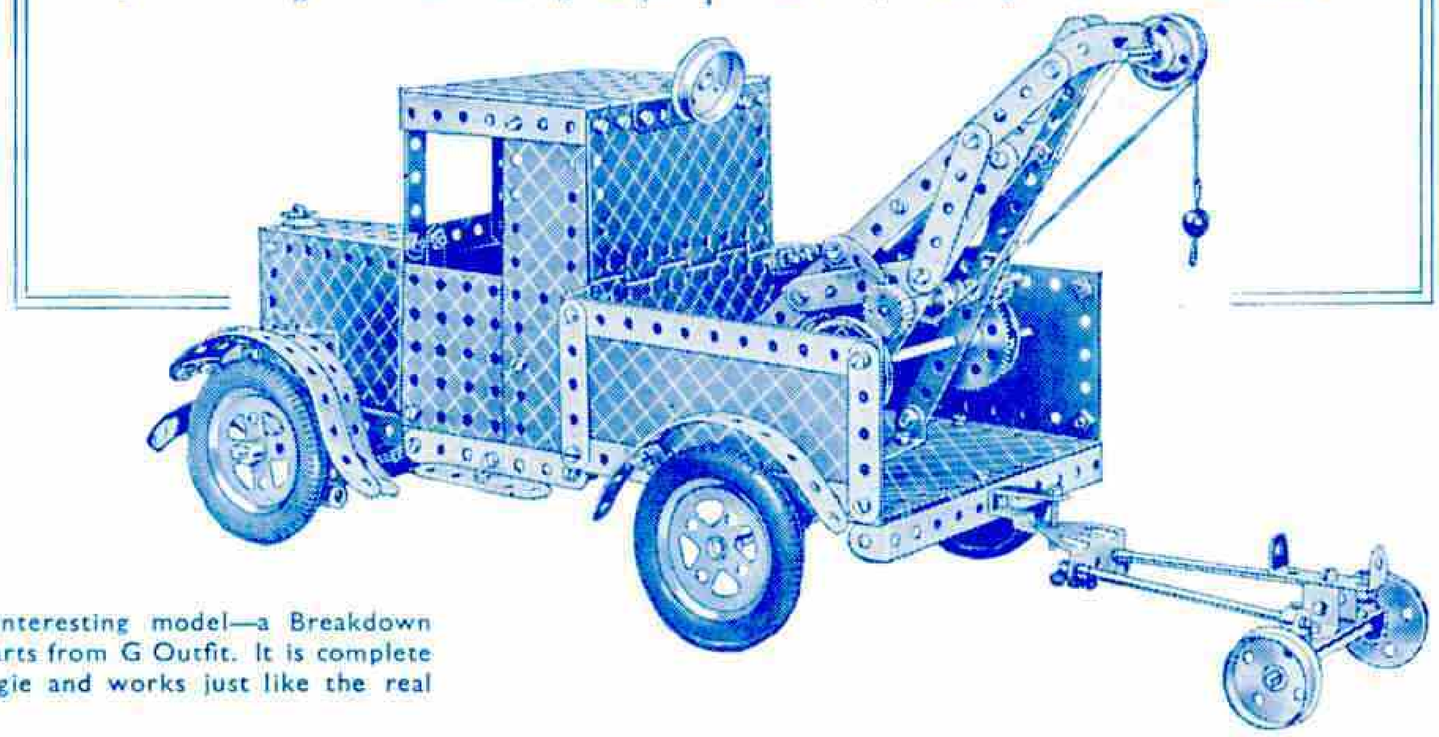
Prices of Meccano Outfits

COMPLETE OUTFITS

O	Outfit	each	3/6
A	,, ...	,,	5/-
B	,, ...	,,	7/6
C	,, ...	,,	10/-
D	,, ...	,,	15/-
E	,, ...	,,	20/-
F	,, ...	,,	30/-
G	,, ...	,,	55/-
H	,, (Carton)	,,	72/6
Hw	,, (Cabinet)	,,	97/6
K	,, (Carton)	,,	132/6
Kw	,, (Cabinet)	,,	157/6
L	,, ...	,,	400/-

ACCESSORY OUTFITS

Oa	converts O Outfit into A ...	each	1/6
Aa	,, A ,, ,, B ...	,,	2/6
Ba	,, B ,, ,, C ...	,,	3/-
Ca	,, C ,, ,, D ...	,,	5/6
Da	,, D ,, ,, E ...	,,	5/6
Ea	,, E ,, ,, F ...	,,	11/-
Fa	,, F ,, ,, G ...	,,	26/6
Ga	,, G ,, ,, H ...	,,	17/6
Ha	,, H ,, ,, K ...	,,	60/-
Ka	,, K ,, ,, L ...	,,	225/-



Here is another interesting model—a Breakdown Lorry built with parts from G Outfit. It is complete with crane and bogie and works just like the real thing.

MECCANO LTD. — BINNS ROAD — LIVERPOOL 13

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